IRON TRADE REVIEW AND WESTERN MACHINIST

A JOURNAL OF MANUFACTURES, HARDWARE, METALLURGY AND INVENTION.

WEEKLY EDITION VOL. XVII—No. 22 | CLEVELAND, O., MAY 31, 1884. | MONTHLY EDITION VOL. II—No. 6.

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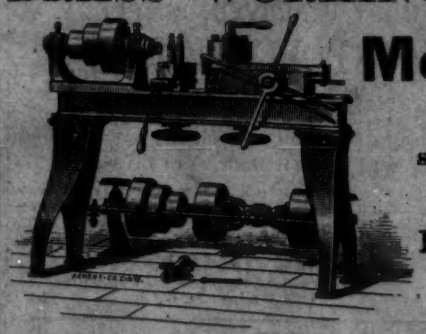

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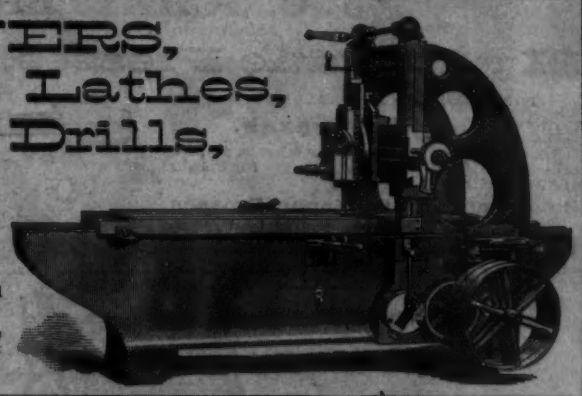

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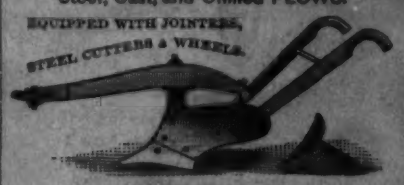

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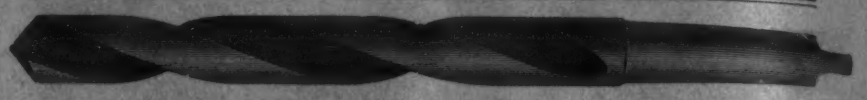

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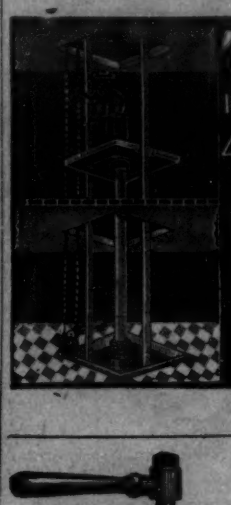

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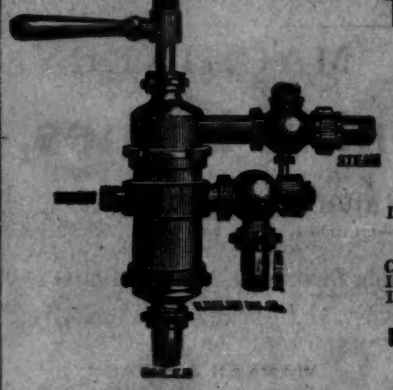

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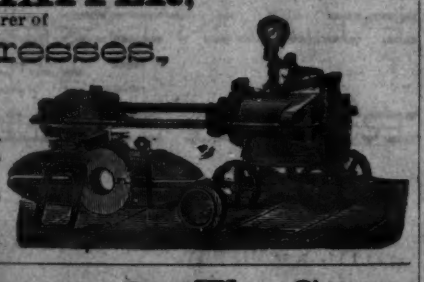

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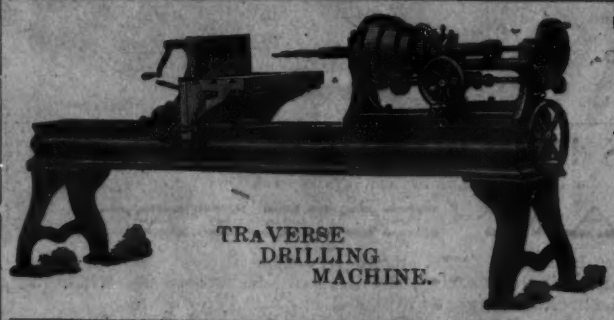

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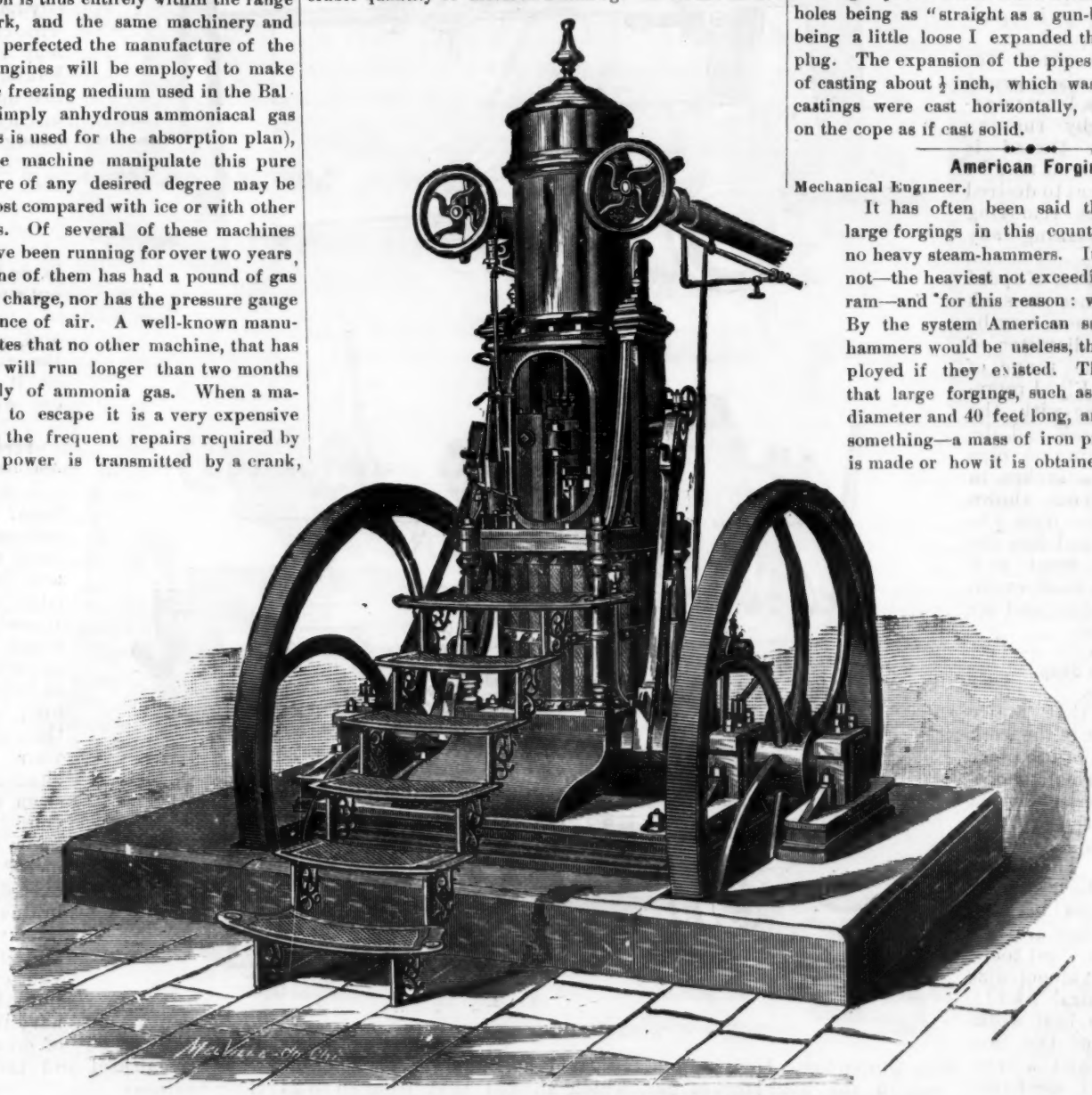
WEEKLY EDITION. VOL. XVII—No. 22. | CLEVELAND, O., MAY 31, 1884. | MONTHLY EDITION VOL. II.—No. 5.

New Machinery.

The Ballantine Ice and Refrigerating Machine.

Notice of the fact that the Cummer Engine Co., of Cleveland, have purchased the patents and entire interest in the Ballantine Ice and Refrigerating Machine has already appeared in these columns. The accompanying excellent cut of the machine shows that it is essentially a vertical engine having a steam cylinder below and gas cylinder above. Both pistons are attached to one rod, as in a direct-acting steam pump. The whole construction is thus entirely within the range of regular engine work, and the same machinery and processes which have perfected the manufacture of the Cummer automatic engines will be employed to make these machines. The freezing medium used in the Ballantine machine is simply anhydrous ammoniacal gas (not aqua ammonia as is used for the absorption plan), and so easily does the machine manipulate this pure gas, that a temperature of any desired degree may be had at a very small cost compared with ice or with other machines and systems. Of several of these machines now in use, which have been running for over two years, it is stated that not one of them has had a pound of gas added to the original charge, nor has the pressure gauge ever shown the presence of air. A well-known manufacturing chemist states that no other machine, that has come to his notice, will run longer than two months without a fresh supply of ammonia gas. When a machine allows this gas to escape it is a very expensive item which, added to the frequent repairs required by machines where the power is transmitted by a crank, makes up a large expenditure at the end of a year, which the Ballantine machine entirely avoids.

Summing up the advantages claimed for the Ballantine Ice Machines, the manufacturers hold: that they are the only direct-acting vertical machines made. and therefore avoid all risk of accident to which machines driving the pump by cranks are constantly exposed that the machines work easily and smoothly, and without noise; that they do not require skilled attendance and constant watching; that they use less fuel and less than one-half the water which other systems require, that they produce a slow a temperature as may be desired, and maintain a perfectly dry atmosphere; that the ammonia cylinder is so thoroughly sealed that no air can enter nor can any gas escape; that there is no odor, no appreciable loss of gas and the machines run for years without recharging, and there is no corrosive action whatever, and that the the machines are constructed in a first-class manner, are guaranteed to do their work and the prices are very reasonable. Further particulars should be addressed to the Cummer Engine Co., Cleveland, O.



THE BALLANTINE ICE AND REFRIGERATING MACHINE.

Send for sample copy of IRON TRADE REVIEW, free.

Castings With Long, Small Cores.

A writer in an exchange gives the following hints upon the subject of long, small cores, which will interest some of our readers: "Occasionally a casting is wanted three or four feet—more or less—in length, with a small hole 1 inch or less in diameter through its entire length. The exact diameter of the hole is not generally of so much importance as that it shall be reasonably straight. Core boxes, 1 inch in diameter and 3 or 4 feet in length, are not very common in the average foundry, and a 1 inch core, 4 feet long, would possess a good many elements of uncertainty, when surrounded by any considerable quantity of metal in a casting. A friend of the superintendent came to me about eight o'clock one day recently and wanted eight castings that day, the castings to be 4½ feet long and ten inches square, with a hole through their entire length to easily receive a 1 inch rod. Slight imperfections on the surface of castings would be tolerated, but the holes must be quite straight. For about five minutes I was perfectly satisfied that lunacy and idiocy were frightfully on the increase, and the way I hauled that superintendent over the coals (when he was safely out of hearing) had a good effect in relieving my mind, and when the vent was well off I thought I would do the job out of pure spite. I had eight pieces of gas pipe, that would let a 1 inch rod pass freely through them, cut off 5 feet 6 inches long, so as to leave 6 inches on each end for print; I had them coated with shellac, quite thick, and sifted on them fine parting sand until no more would stay. They were put where they would keep warm and dry nicely, and when dry I blacked them carefully, and then rammed them full of green sand facing, ramming up a ¼ inch vent rod in the center to let off the vent. This was done so that if the sand, blacking, etc., should cleave off the outside, there would still be sand inside to defend the hole and prevent collapsing. These cores were ready to set in two hours, and it was found when in place in the molds, they were so stiff and rigid that no chaplets were required. The eight pieces were cast and came out all right, the holes being as "straight as a gun-barrel." The pipes being a little loose I expanded the ends with a taper plug. The expansion of the pipes bulged out each end of casting about ½ inch, which was chipped off. The castings were cast horizontally, and were as sound on the cope as if cast solid.

American Forging.

Mechanical Engineer.

It has often been said that we cannot make large forgings in this country because we have no heavy steam-hammers. It is true that we have not—the heaviest not exceeding 20 tons weight of ram—and for this reason: we do not need them. By the system American smiths adopt, heavy hammers would be useless, they would not be employed if they existed. The popular idea is that large forgings, such as shafts 28 inches in diameter and 40 feet long, are drawn down from something—a mass of iron probably, but where it is made or how it is obtained few know. As a matter of fact, all large forgings in this country are made of billets, welded piece-meal, or one upon another, and for this purpose light hammers, not exceeding six or eight tons weight of ram are used. They answer the purpose admirably, if the work done by them is any criterion.

The First Boring Tool.

The first boring tool may be assumed to be an awl of some kind. Pliny states that Dedalui invented the gimlet in 1240 B. C. It was destitute of a screw point, but it may have had a hollow pod, and a crosshead forming a handle. Awls are shown in Egyptian tombs of 1706 and 1490 B. C. The screw point was added to the gimlet in the course of time, and, within recollection, the twisted shank, which makes it self-discharging. The hint was taken from the auger proper, which may be called a magnified gimlet, now that their specific features have become so closely assimilated in form and function. The auger (terebra) was a Greek tool.

A RULE for finding the width of belt for any given horse power: Multiply 33,000 by the horse power required, and divide the product first by the length in inches covered by the belt, and then by its speed.

Improved Pipe Threading and Cutting-Off Machines.

Some improvements have r cently been made in pipe threading and cutting off machinery for D. Saunders' Sons, Yonkers, New York. Two of the latest of their machines for these purposes are shown in the accompanying engravings. These tools are designed especially for use in mills where continuous and heavy work is to be done, and are especially built to withstand severe and prolonged strains. They are unusually strong and powerful, and are at the same time intended for rapid operation, being so constructed as to require only a minimum of time for adjustment or change of work. For gripping the pipe an improved chuck is provided of such a construction that it may be loosened or gripped by a simple movement of a lever without stopping the machine. This lever movement, by means of a system of sliding blocks and levers, secures the required motion of the chuck jaws for one size of pipe, as well as furnishes by an easy movement of the lever enough leverage to grip the pipe firmly. The adjustment of the jaws for dif ferent sizes of pipe is equally simple and quick.

The dies, shown on the machines, are also opened and closed by a lever movement, whereby running back over the thread is avoided, and thread may be cut and pipes cut to desired lengths without removing the dies or making any change.

The graduations of speed in these machines are such that suitable ones may be had for each diameter of pipe within the range of the machine. Fig. 1 represents a machine with the chuck at the back end, designed for cutting on pipe from one to two inches in diameter. The one shown in Fig. 2 will cut from ½ to 2 inch pipe, and has the chuck on the front end. Both machines show excellent workmanship, and are very substantial.

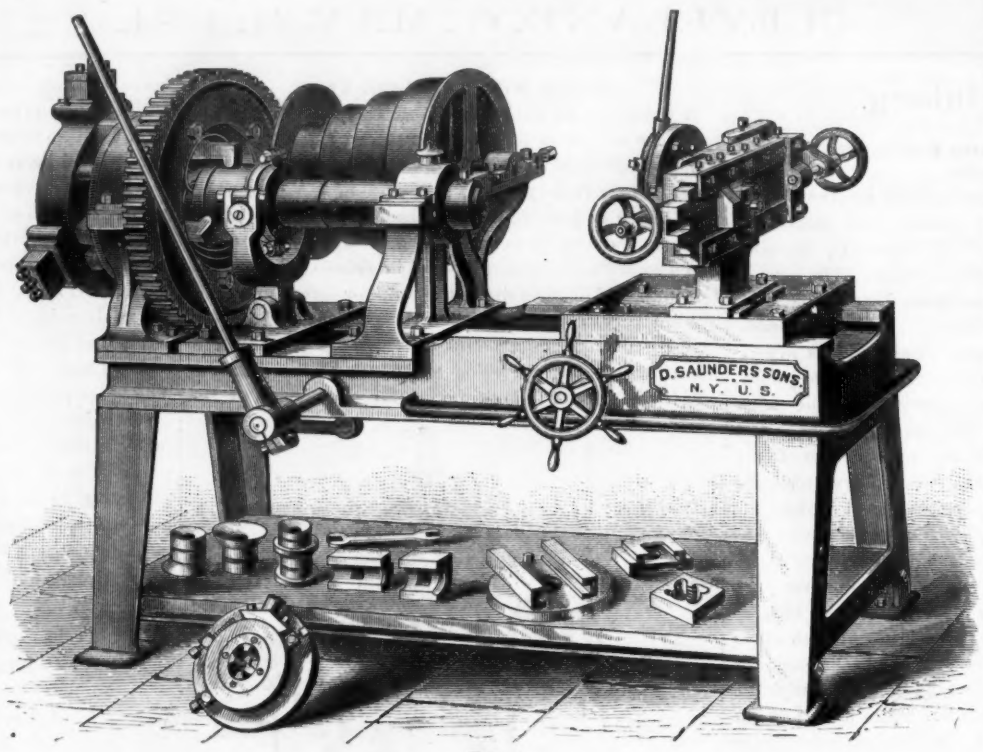


FIG. 1.

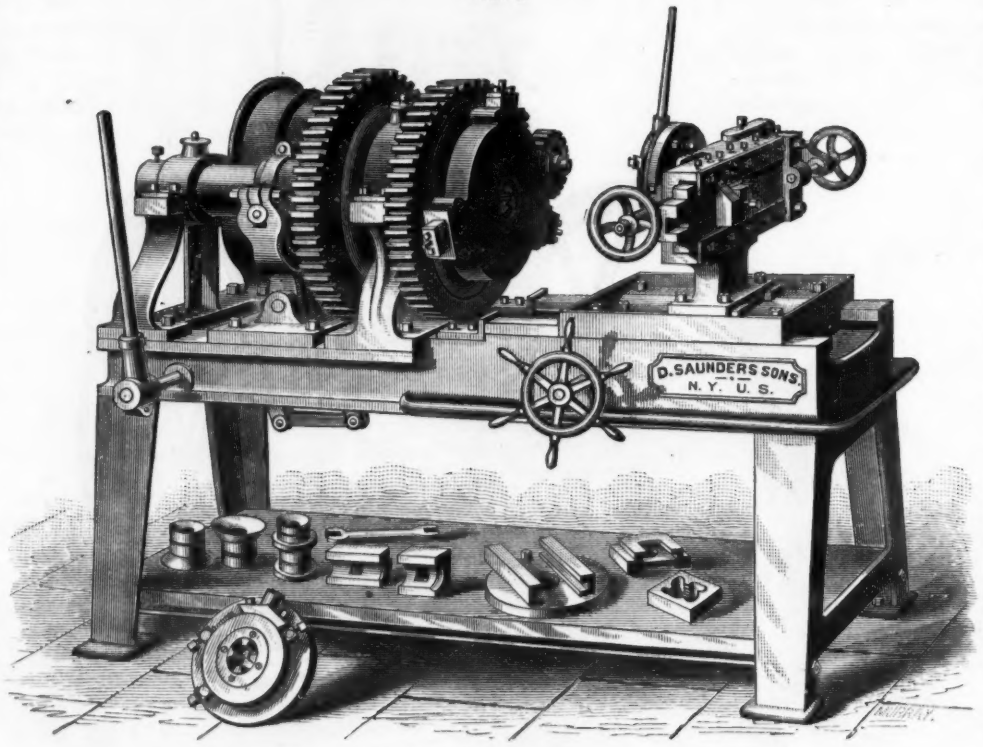


FIG. 2.

IMPROVED PIPE-THREADING AND CUTTING-OFF MACHINES.

The Little Shop.

Scientific American.

It is time that notice should be taken of the work done as well as of the place taken by our small shops. The "big concerns" do not monopolize all the skill and mechanical capability in the country. They may profess to do the best work and produce the best results, because they are furnished with the best tools. But they do not monopolize all the mechanical skill, nor collect the best workmen. Many of the best manipulators, and a very large proportion of the most exact mechanics, are in the little shops; content, may be, to be the foremen, when in a big shop they would be only first-class workmen. The small shop men are valuable in any shop where mechanics, rather than operatives, are required, because they are generally "men at a pinch," "expediency men," and generally excellent workmen.

The proprietor of a large manufacturing establishment, building fine tools of a particular character, claims that his best men come from small shops were makeshifts and contrivances are the rule. "Such men," he says, "can make the shop hum" by their methods.

It is very convenient to have a shop full of adapted tools, but it is also convenient to have in the shop graduates from "the little shop" who can contrive as well as tend a machine.

Caloric Engines.

Prof. Jenkin, who recently delivered an interesting lecture on heat and gas engines before the Institute of Civil Engineers in England, mentioned that the theoretical results to be obtained by the simple adoption of a regenerator, through which the mixture of gas and air passed on entering the cylinder, and repassed on leaving it, seemed to show that it might be serviceable in sensibly increasing the efficiency of engines. Gas engines had been made, he said, giving one indicated horse power for 20 cubic feet of gas, which showed that from 16 to 24 per cent. of the total heat generated was actually converted into indicated horse-power, notwithstanding the enormous waste of one-half by conduction across the walls of the cylinder. In absolute heat efficiency, therefore, the gas engine is already 100 per cent. better than the steam engine.

Strains on Iron and Steel.

Boston Commercial Bulletin.

The various experiments which have been made with a view to determine, if possible, the effect of percussion on iron and steel, show some interesting results. In some recent experiments of this kind in England, square pieces of iron and steel boiler plates were used for the purpose, the former being seven-sixteenths of an inch thick, and the latter three-eighths, a charge of one and one-half pounds of gun cotton being used in each experiment. The plates were laid over, respectively, a basin-like cavity in the top of a large block of iron, and the gun-cotton was exploded over the centre, at a height of about nine hundred inches. The outcome of these experiments proved that the mild steel plates of the Siemens and Bessemer processes, tempered in oil, possess an endurance and ductility far beyond what have been known to characterize British wrought irons, and that steel possesses certain positive advantages over iron, in the manufacture of boilers, locomotive tires or rails.

Long Steel Rails.

The Osnabruck Steel Works have recently been manufacturing steel rails eighty-eight feet six inches long, which have been laid down on railway bridges crossing the city of Hanover. It was found that the noise caused by passing trains was becoming such a nuisance that a remedy had become a necessity. The cause of it was the violent vibration at the rail joints, and the engineers hit upon the expedient of having rails made long enough to cover the whole length of the bridges. Since they were laid down, the nuisance caused by the rail joints has ceased. The use of rails of the length stated is, as far as we know, without a parallel in the history of railway construction, and reflects credit alike on the engineers who suggested it, and the manufacturers who made them.

Foremen and Mechanics.

Am. Jour. of Railway Appliances.

Are you working short time? If so, avail yourself of the extra leisure thus afforded to improve and increase your knowledge of your business. Knowledge is power. If times are dull and you cannot earn as much money as usual, earn what in the long run is worth more than money, knowledge of your trade! Does your chance for advancement seem slight? Do some of your fellow workers who know less than you earn more? If so, they are the exceptions. The rule is, brains will win. Sooner or later your time will come, and if you are competent you can step up to a more lucrative position. In ordinary times there are plenty of good positions for men who are faithful and thoroughly understand their business.

Boiler Houses.

Toledo Manufacturer.

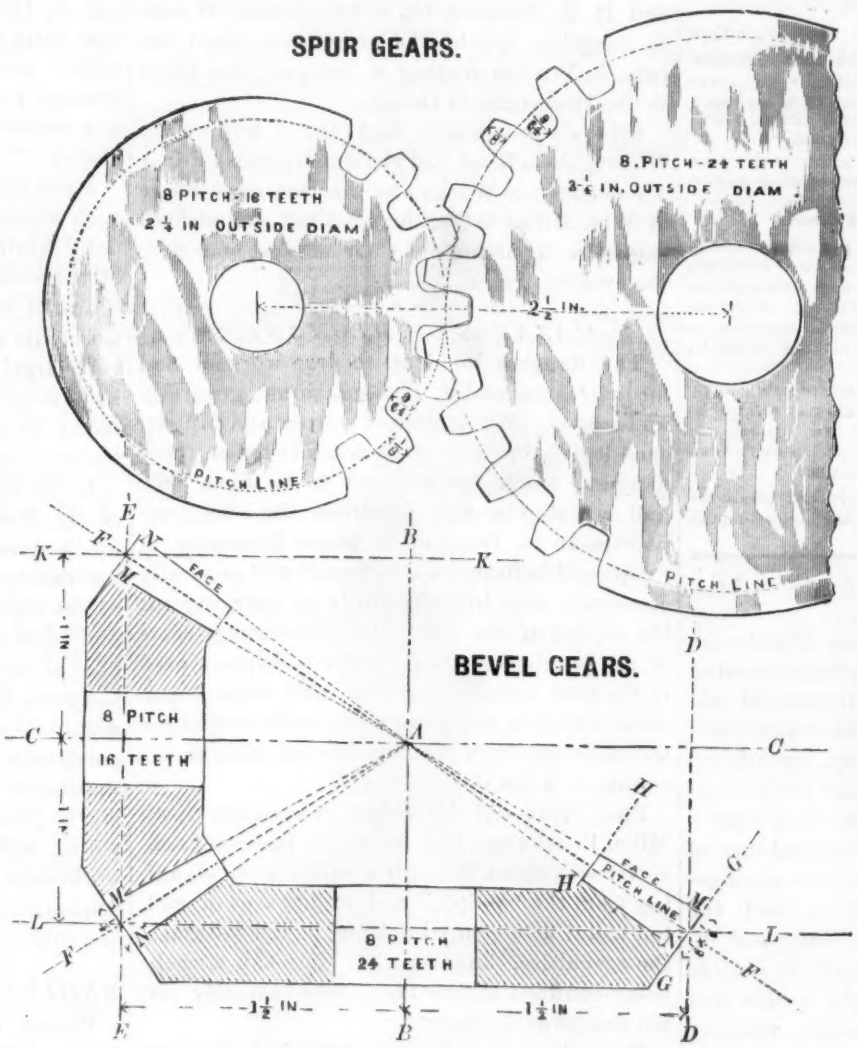
Boiler houses should always be built of brick, with heavy walls and brick stacks; and whenever possible be detached from every mill. Where it is possible, see that there is no opening through separating wall, or that such opening is protected by a solid wooden fire door, covered with bright tin or galvanized iron. The safety of the boiler house depends upon the height of the roof. No wood should be allowed within ten feet of boilers or breeching, and fifteen feet is better.

Hints from Practical Men.

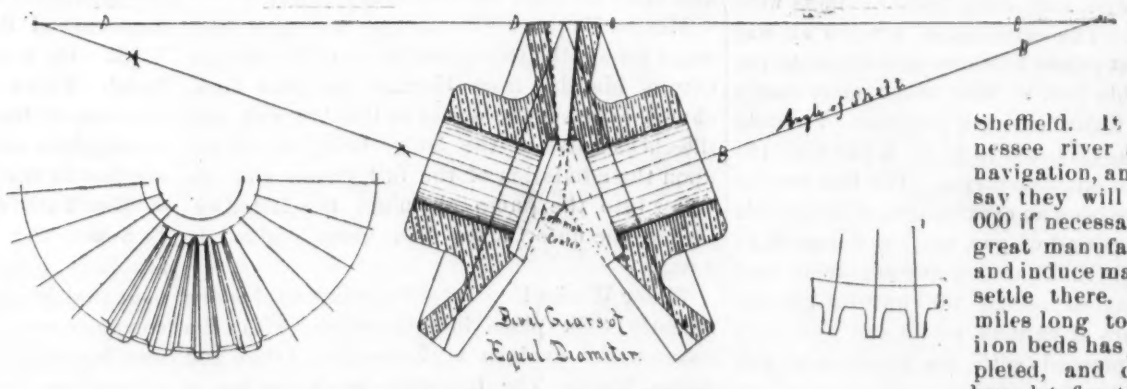
Laying Out Gears.

Warner & Swasey, Cleveland, O, in response to request, furnishes the following as their system of laying out spur and bevel gears: The accompanying cuts of spur and bevel gears, were engraved directly from the drawing and by their aid we will endeavor to give some directions by which all diametrical pitch gears can be laid out preparatory to turning and cutting. In spur gears, first decide upon the pitch, which means the size of teeth. Should it be 8 pitch, as shown in cut, draw a circle measuring as many 8ths of an inch in diameter as there are to be teeth in the gear. This circle is called the pitch line. Then with a radius $\frac{1}{8}$ of an inch larger draw another circle from the same centre, which will give the outside diameter of gear, or $\frac{2}{8}$ larger than the first circle. Thus we have for the diameter of an 8 pitch gear of 24 teeth, $\frac{26}{8}$. Should there be 16 teeth, as in the small spur gear, the outside diameter would be $\frac{18}{8}$, the number of teeth being always two less than there are 8ths—when it is 8 pitch—in the outside diameter. From the pitch line to the bottom of the teeth it is the same distance as to the top, excepting the clearance, which is always one-eight of the pitch, making in the example $\frac{1}{64}$. Thus the tooth measures $\frac{9}{64}$ from the pitch line to the bottom of the space; but the clearance being provided for in the cutters, the two gears would be laid out to mesh together just $\frac{2}{8}$. These rules apply to all pitches so that a 5 pitch gear with 24 teeth would have an outside diameter of $\frac{26}{5}$; or if 3 pitch, 40 teeth, it would be $\frac{42}{3}$. Again if a blank was $4\frac{1}{6}$ ($\frac{25}{6}$) in diameter and cut 6 pitch, it should contain 23 teeth.

In laying out a pair of bevel gears, after deciding upon the pitch, draw the centre lines BB and CC, intersecting at right angles at A. Then draw the lines DD and EE the same distance each side of BB and parallel to it; the distance from DD to EE being as many 8ths of an inch —if it be 8 pitch—as there are teeth in the gear. In the example the number of teeth is 24, therefore the distance from DD to EE will be $\frac{24}{8}$, or $1\frac{1}{2}$ inches each side of BB. KK and LL are similarly drawn, but there being 16 teeth in the small gear the distance from KK to LL will be $\frac{16}{8}$, or one inch each side of CC. Then through the intersections of DD and LL, EE and LL, and EE and KK draw the diagonals FA. These are the pitch lines. Through the same points draw lines as GG at right angles to the pitch lines, forming the backs of the teeth. On these lines lay off $\frac{1}{8}$ of an inch each side of the pitch lines, and draw MA and NA, forming the faces and bottoms of the teeth. The lines HH are drawn parellel to GG, the distance between them being the width of face. The face of the large gear should be turned to the lines MA and the small gear to NA. For other pitches the same rules apply. If 4 pitch, use 4ths instead of 8ths; if 3 pitch, 3rds, and so on. Bevel gears should always be turned to the diameters and angles of the drawings.



LAYING OUT SPUR AND BEVEL GEARS.



SHORT METHOD OF DRAWING BEVEL GEARS.

Short Method of Drawing Bevel Gears.

TO THE EDITOR:

First draw the lines A A and B B at the required angle of each shaft line of shafting, which in the example given are not right angles. Then set out the diameters of the wheels which are required as shown in sketch, with proportions same as for spur gearing at the largest diameter; then by extending the lines D D and C C until they intersect with the lines A A and B B Then with the radius D D and C C we can simply consider these radii as the radius of two spur wheels of these diameters and by extending every line to the one common centre we get the proper bevel of the teeth at every point.

E.

CLEVELAND, May 26, 1884.

Soft Steel in Water Conductors.

We beg to call the attention of those of our readers who are interested in building materials either as architects, builders or proprietors, to the advertisement of the S. S. S. Conductor Co., in this paper. The article they manufacture is the only expanding water conductor made that will really do what is claimed for it, viz.: expand without bursting when water freezes in it, an advantage which will be appreciated by all those who have suffered from burst rain spouts. None but the best material is used in the manufacture of these conductors. They are made, as may be desired, either of best bloom iron galvanized, of soft steel sheet galvanized, of soft steel kalameina or of soft steel leaded, or terne plate, as it is generally termed; the two latter costing about the same price as the ordinary round conductor pipe when made of good quality of tin plate and being superior in the advantage of expansion, and in being made in single sheet lengths of six feet, thereby reducing greatly the number of joints in a conductor which are always weak points in the ordinary pipe. The use of soft steel in place of iron has been found in this specialty, as in other branches of the iron trade, a great advantage, as it is tougher and more durable than the iron, and has given entire satisfaction wherever used.

The Work of a Single Hair.

In the base of the Capitol at Washington is the enginery by which the House, the Senate and the committee rooms are warmed and ventilated, and the gas lighted by electricity. It is altogether a big apparatus, consisting of three immense fans, four engines and eight boilers, with the necessary appliance for regulating the temperature and moisture of the air supplied to the nation's legislators. The instrument which tells whether the air is too moist or too dry is operated by a single human hair. A perfectly dry air is put at 0; saturated air, that is air carrying all the moisture it will hold, is put at 100. A dial with a hand like that of a clock represents the different degrees from 0 to 100. The human hair absorbs moisture like a rope, and like a rope it becomes shorter when wet. The difference in length between a hair six inches long when wet and the same hair when dry is made to represent the hundred degrees of moisture on the dial, and the hand or pointer moves backward or forward as the moisture in the air varies. If it becomes too dry more steam is thrown in; if too moist, less steam is allowed to escape, and thus the atmosphere for the nation's statesmen is regulated and kept at the healthful point, which is about fifty degrees.—[Exchange.

A New Southern Iron Centre.

A heavy syndicate of New York and Atlanta capitalists have bought 6,000 acres of land in Colbert county Ala., and laid out a city, and the first lots were sold recently at auction. Though there is not a building on the land, 118 lots were sold for $130,000, an unprecedented price for Southern real estate. Five thousand persons were present, and great interest was shown. The stock of the corporation has reached a high valuation. The town is called Sheffield. It is on the Tennessee river at the head of navigation, and the company say they will spend $1,000,000 if necessary to make it a great manufacturing center, and induce manufacturers to settle there. A railroad 18 miles long to the coal and iron beds has just been completed, and contracts have been let for the erection of furnaces, gas and water works and a hotel.

MECHANICS refers to a story of a consignment of "incandescent lamps burning with 45 volts." The consignee acknowledged the receipt of the lamps, but asserted that a diligent search of the packing cases failed to reveal the 45 volts, an ample illustration of the fact that considerable ignorance yet prevails as to the meaning of not a few electrical terms. The incident recalls an account of a railway company who exacted higher rates for uncharged accumulators, on the supposition that the latter were empty

IRON TRADE REVIEW
AND WESTERN MACHINIST

ESTABLISHED 1868—SEVENTEENTH YEAR.

Devoted to the Manufacturing, Hardware, Scientific, and Mechanical Interests of the Country.

PUBLISHED EVERY SATURDAY.

Office—Rooms 30 and 31, Board of Trade Building, 122 Water street,
CLEVELAND, OHIO.

TELEPHONE 852.

WILSON M. DAY, - - - - - - - Editor
FRANK N. CARTER, - - - Business Manager

SUBSCRIPTION, (POSTAGE INCLUDED), { Weekly $3.00 per Year. Monthly .60 per Year.

☞ Advertisng Rates Furnished on Application.

Entered at the Post Office at Cleveland as second-class matter.

To Machinists, Manufacturers and Others.

THE publishers of the IRON TRADE REVIEW solicit items of information concerning manufacturing and other establishments in any part of the country, and all such items will be promptly inserted in these columns, free of charge. Facts are the only things needed; and all communications should be accompanied with the name of the contributor—not for publication—but as a guarantee of good faith.

Manufacturers, machinists and engineers are particularly requested to communicate any matters of interest relating to their specialties. No one need be deterred from sending any interesting facts in his own language, as all such contributions will be properly revised before sending to press.

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MECHANICAL ENGINEERS AT PITTSBURGH.

No more interesting city than Pittsburgh could have been chosen for the annual meeting of the American Society of Mechanical Engineers, last week. Her fourteen magnificent bridges, her ponderous machinery, her hill-top scenery, her immense iron and steel works combined to offer attractions to men of all tastes, but especially to those of a mechanical turn of mind. The attendance was good; the arrangements were generally satisfactory, and the papers presented were full of interest and instruction. We propose very briefly to outline the work accomplished: The first session was held Tuesday evening in conjunction with the Engineers' Society of Western Pennsylvania. The entire evening was devoted to the fuel-gas question. A most elaborate report was presented by a committee previously appointed for that purpose, and many valuable facts were brought out. The conclusion arrived at was that if sold at prices now charged, 50 cents per thousand cubic feet, it was much more costly than coal for manufacturing purposes. It would have to fall to 7.8 cents to be on a par with the cost of coal in large factories. The best results obtained have been an evaporation of 20 pounds of water per pound of gas, against 9 pounds in case of coal. On Thursday the engineers had an opportunity of seeing the natural gas applied to boilers at various works and were very favorably impressed with its steady heat and complete combustion.

The papers read at Wednesday's session were as follows: "Helical Springs," by John W. Cloud, of Altoona, Pa.; "A Practical Solution of the Perfect Screw Problem," by Prof. W. A. Rogers, of Cambridge, Mass.; "Rules for Conducting Boiler Tests," by Wm. Kent, of New York; "New York to Chicago in Seventeen Hours," by W. B. LeVan, of Philadelphia; "Estimates for Steam Users," by Prof. C. E. Emery, New York; "A Drawing Office System," by H. R. Towne, of Stamford, Conn.; "A Positive Feed Indicator," by Oberlin Smith, of Bridgeton, N. J.; also on Friday, "Comparison of Three Modern Types of Indicators," by Geo. H. Barrus, of Boston. All of these papers are on file for early publication in these columns.

On Thursday the visitors were treated to an excursion thirty miles up the Allegheny Valley, going up over the Western Pennsylvania railroad and returning on the opposite side of the river, over the Allegheny Valley railroad. On this trip they visited and inspected the model Isabella and Lucy furnaces, the fifteen-acre plate-glass factory at Creighton, the Natrona Soda Works, the Pittsburgh Water Works, the Keystone Bridge Works, the Crescent Steel Works and H. K. Porter & Co.'s Locomotive Works. A tempting lunch was served on board the cars, and in the evening a banquet was given at the Monongahela House.

Friday's programme included a trip up the Monongahela River and visits to the great Edgar Thomson Steel Works and the Duquesne Forge of Wm. Miller & Co., the tired but well-pleased engineers departing for their several homes by the evening trains.

HAZARDS OF MECHANICS.

The dangers incident to iron-workers and mechanics generally are, we think, generally underrated. While modern science and enlightened legislation have done much to lessen these dangers, much remains yet to be done. We hail as a step in this direction the recent appointment in Ohio of a State Inspector of Shops and believe manufacturers will generally co-operate with him cheerfully in carrying out the objects of the law. As illustrating some of the peculiar accidents liable to happen even in the best regulated shops and mills—accidents which in many cases cannot be foreseen—we condense from various recent sources accounts of a few out of many:

Steel Mills—At the Edgar Thompson Steel Mills, Pittsburgh, last week, a Bessemer converter was upset through a mistake in signaling from the "pulpit," and eight tons of mol ten metal were poured out among the workmen, the casualties, however, by almost a miracle, being confined to two men, both severely but not dangerously burned.

Blast Furnaces—By the breaking of a pole used by a workman at the Central Furnace, Cleveland, in closing up the hot pig-iron molds, the boiling iron was "splashed" into his face and upon his legs, burning him severely.

Marine Engines—To start up a clogged feed-water pump, the second engineer of the steamer City of Merida, from Havana for New York, changed the suction direct to the hot well, and the check valve in the boiler being struck up, upon the admission of the full pressure of the boiler into the pump chamber, the latter exploded, the unfortunate man being scalded to death.

Water Works Engines—Singular explosions recently took place in connection with the water works engines at Zanesville, Ohio, and Salem, Mass. The following from the log of Engineer Bennett, of the Salem works, succinctly tells the story which answers for both: "Overhauling water ends of No. 1 engine, removed bonnet of 'right' plunger, and found it full of water and *under a pressure;* found the 'left' plunger empty, but containing an explosive gas which did explode when 'Mark' inserted a lamp to examine the inside. Result: Burned hand, singed eyebrows and hair. What was it?" Answering the latter question in the *American Machinist*, Mr. W. M. Barr says that the explosive gas was carburetted hydrogen, generated by the action of the water which leaked into the plunger.

Foundries—When the watchman in the Taylor & Boggis foundry, Cleveland, entered the japanning department, on a recent night, a terrific explosion occurred, sending him through a window and causing general distruction. The proprietors cannot account for the accident.

Wood-working Establishments—At Jamestown, N. Y., the other day, a long steel chain came in contact with a four-foot circular saw, sending flying steel missiles in all directions, but, singularly, hurting no one.

Boiler-rooms—Investigation of a late explosion at Gouverneur, N. Y., disclosed the fact that there were four transverse ruptures, two of which were in the dome sheet and to be accounted for, but what caused the remaining two is a mystery. Six men were killed by this accident.

Some account should be taken, in many of such accidents, of the indifference begotten of daily familiarity with machinery, on the side of the workmen, and, on the other hand, the desire of manufacturers to push their production to its utmost capacity, both of which causes very largely increase the hazards to both life and property. A wise State supervision, it seems to us, should take cognizance of both these elements.

In Birmingham, England, the excellent work of Mr. Bowling, Chief Inspector of Factories for the past 13 years, has resulted in greatly decreasing the hazards of workingmen. In a recent report he says: "It is very gratifying to find 'that though accidents occur in Birmingham at the rate of about one a day throughout the year, they have diminished by a fourth part within the last ten years.' The newspaper paragraph adds, 'the diminution is no doubt ascribable to the greater care now enforced by law in protecting machinery and otherwise providing against danger in manufactories and workshops, and to the responsibility thrown on employers in respect to the security of scaffolds and other trade appliances.'"

ENGINEERS UNDER THE CAMERA.

Would our readers like pen picture introductions to some of the leading mechanical engineers of the country, as sketched at the recent meeting of the American Society of Mechanical Engineers, at Pittsburgh? The most distinguished figure in these gatherings is, perhaps that of Professor Chas. E. Emery, of New York. He is tall, broad-shouldered and frank-faced. Thick, iron grey hair and beard admirably set off features that denote at once great intelligence and indomitable perseverance. His services in solving the steam-heating problem in New York are well-known. Professor John E. Sweet, the President of the Society, is a scholarly looking man, yet of so practical a bent that he does quite as well at the head of a company manufacturing a steam engine of his own invention as he did in the class-room. He is of medium height, engaging appearance and modest demeanor. Mr. E. D. Leavitt, of Cambridgeport, Mass., ex President of the Society, is probably one of the best paid mechanical engineers in the country, and his large attainments and extended experience justly entitle him to all that he gets. He has a most kindly face and pleasant voice. Mr. William Kent, of New York, is the generally acknowledged leader among the younger members of the Society. He has a bright, flashing eye and an earnest manner. Always ready in debate, he never forgets to be courteous, and his "points" are in-

variably well taken. Mr. Charles T. Porter, of New York, a rather small, white-haired man, stands close at the head of the profession in this country, and his counsel is eagerly sought by the younger engineers. Nor do they seek in vain; he is uniformly genial and freely communicative. Mr. W. Barnet LeVan, of Philadelphia, has not altogether a prepossessing exterior but he supports an extremely "long head." Mr. M. C. Bullock, of Chicago, is to be distinguished by his rotound form and inexhaustible good humor. Mr. H. R. Towne, of Stamford, Conn., adds to a practical mind a polish which readily marks him as an Eastern man. As a class, the mechanical engineers of the country rank high, both for their professional attainments and for their unswerving integrity.

THE COMING METAL.

The chase after the cheapest process of producing aluminium still goes on. A Colonel William Frismuth, of Philadelphia, claims to have discovered a process by which it can be produced so as to be sold for $5 per pound, and, and a letter before us, from a Boston gentleman, asserts that he has found the proper party to manufacture aluminium and expects to reduce the price to $2 yer pound. Colonel Frismuth's process is described as follows by the Philadelphia *Evening Star:*

The aluminous minerals, bauxite and corundum, are first calcined by chemical processes to obtain the alumina. These processes prepare it for the retorts, in which it is placed and exposed to a high heat so as to vaporise it. The vapors of the alumina, as they ascend, meet the vapors of the sodium from the sodium retorts; the sodium vapors extract the oxygen from the alumina, and the metallic aluminium is thereby produced in very small globules—not visible, in the cool slag, to the unaided eye. Next, the aluminium in form as above stated, combined with its fluxes, is put into crucibles, and remelted at high heat, whereby the aluminium is concentrated in large globules. After this it is poured out in shape of rough ingots, like pig-iron. When hard, it is pounded up, washed, and the large globules which have been made are put into shape of marketable aluminium.

Meanwhile the new metal is coming steadily into commercial importance abroad, a large display of articles made from aluminium having been made at the recent expositions at London and Calcutta.

THE demolition of a tall brick smoke stack, left standing from a recent fire, was successfully(?) accomplished at Ithaca, N. Y., the other day. An expert drilled a hole in the base of the structure, inserted 5½ pounds of dynamite, warned the small boys away, and then set off the charge. About 100 tons of brick and stone were lifted bodily in the air and came down with a terrific crash. Fortunately the casualties were confined to one old lady, a tree, and a portion of an adjacent house. The expert was satisfied.

THE first idea of the steam engine owes its origin, it is said, to a drunken freak in Florence, in which an empty wine bottle was flung into the fire. Hastily snatching the heated bottle from the flames, Captain Savary plunged it neck foremost into a basin of cool water and was delighted to find a vacuum had been created, the water rushing in and half filling the vessel. His first crude engine embodied the idea thus obtained.

MANY accidents in mills and shops arise from the stumbling or falling of the men, the arm being thrown out so as to be caught in the spokes of fly-wheels, etc. An effective plan for preventing such accidents in England is to fill the discs of the wheels either with wood, iron-plate, or stout card-board, thus rendering them almost harmless. This contrivance is very cheap and easy of application.

IT is understood that a company is forming in Cleveland for the completion of experiments in the use of petroleum for puddling and smelting purposes. The practical success of puddling with this fuel was recently demonstrated in this city.

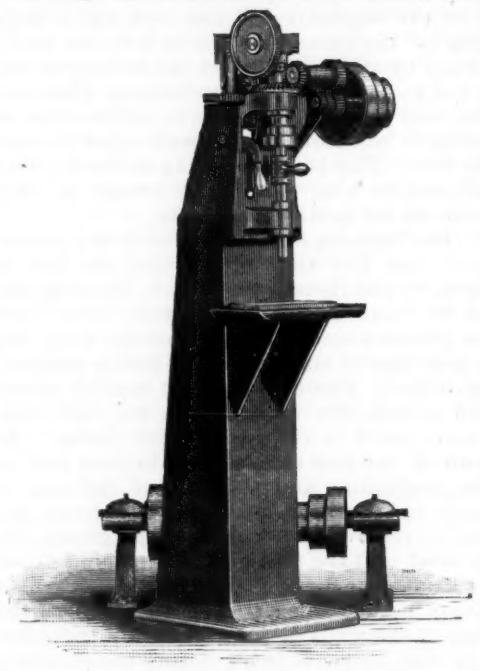
WE learn that the bill for a Test Commission (to conduct tests of iron, steel and other materials) has been given precedence by the House Committee on Manufactures and that the prospects are good for its being taken outof the regular order and passed at this session.

IN a town in Central Ohio is a curiosity. He will not read any technical papers because he "knows all about them subjects" anyhow. He should be labeled and preserved in the coming National Mechanical Museum.

WHO will start the project of a National Exposition of Motive Machinery?

Automatic Drill Press.

The illustration presented herewith is that of a drill press of somewhat novel construction,



recently brought out by E. E. Garvin & Co. of 139 to 143 Centre street, New York City. Each head is a self-contained drill press, enabling the manufacturer to mount them, side by side on a single base or framework, in a line of two, three or four, as the character and variety of drilling may demand. The feed is automatic, operating through a cone of three changes to a worm and gear, and thence through a pinion which propels the rack, stepped into top end of the spindle. A noticeable feature of this feed connection is the smooth, light running of the spindle; the result of a step instead of a shoulder contact, thereby avoiding a considerable amount of friction. The spindle is evenly counterbalanced by weight hanging in column. The feed is automatically tripped, and by using a sufficiently heavy weight may be self-returning; when not so arranged, the spindle is returned by pushing up the handle shown in the front of the head. Shown to the left of this handle is the one to engage the automatic feed. Each head is provided with an independent table bolted to the planed face of column, and adjustable up and down upon it. This arrangement is not shown in the cut. A chuck with adjustable back jaw is designed to use especially with this press, fitted so as to receive odd shaped jaws for special pieces, and is operated in the same manner as the ordinary milling machine vise with one screw. Countershaft is single, but has independent movement for each tight pulley and cone, when two or more heads are used together, giving them each an individual action in regard to their driving gear.

MECHANICAL MELANGE.

CITY VS. COUNTRY MECHANICS—The Patent Office reports show that most of modern machines originated in the brains of country mechanics.—[Blacksmith & Wheelwright.

THE COMING LATHE—He will be a shrewder prophet than we are who can say what the lathe of a half century hence will be.—[Mechanical Engineer.

"CHEAP" MACHINERY—Good tools and good workmen yield the best attainable results in the factory, and it is the poorest policy to hire cheap labor to run cheap machinery, if good work is expected as the result.—[American Wood-worker.

ENGINEERS' WAGES—We might mention cases where an engineer has made a saving of more than $15,000 in a year, simply by the application of brains, common sense and faithful earnestness. And yet the man who accomplished this was kept at work for about $1,000 per year.—[Manufacturers' Gazette.

GRACEFULNESS IN MACHINERY—It is a matter for congratulation that the days when engineers would make an article (an engine, a bridge, or what not) 50 per cent. uglier for the sake of turning it out 1 per cent. cheaper are getting past.—[Engineering Review.

PRIMING—Priming is a violent agitation of the water within the boiler, in consequence of which a large quantity of water passes off with the steam in the shape of froth and spray. The causes of priming are an insufficient amount of steam room, an inadequate area of water level, and insufficient width between the flues or tubes for the ascent of the steam and the descent of the water in the boiler.—Bourne.

"MONKEYING" WITH THE ENGINE—We know of an instance where a new Corliss engine was badly maligned by its owner because the engineer was not content to leave the valves set as the builders designed, and by "monkeying" with the connections had increased the lead of the steam valves from one-sixteenth to five-sixteenths of an inch, and had increased the compression by closing the exhaust-valves in the middle of the stroke.—[Millwright & Engineer.

SKETCHING FOR MECHANICS—The practice of sketching as illustrative of verbal statement is an excellent one for mechanics generally to acquire. If one has not the natural impulse in this direction a few lessons in free-hand drawing will not be amiss. Some of the best improvements derive their historical and mechanical value from rough sketches, which told much more plainly than equally crude English the operations and conclusions of a constructive mind.—[English paper.

ANNEALING IRON—Castings from gray iron may be annealed by being packed in coarse sand (quartz) in iron boxes and subjected to a red heat for forty-eight hours. A little common lime, unslaked, added to the sand may quicken the annealing but is liable to "rot" the iron. If the castings are of "white" iron, they should be packed in cast iron boxes with powdered sal-ammoniac and forge scales in the proportion of one by weight of sal-ammoniac to twelve of forge scales.—[Scientific American.

Hardening Cast Iron.

CAST iron may be hardened as follows: Heat the iron to a cherry red, then sprinkle on it cyanide of potasium and heat to a little above red, then dip. The end of a rod that had been treated in this way could not be cut with a file. Upon breaking off a piece about half an inch long it was found that the hardening had penetrated to the interior, upon which the file made no more impression than upon the surface. The same salt may be used to case-harden wrought iron.

Parallel Planing.

American Journal of Railway Appliances.

For planing two parallel sides of a piece of any length, it is best to hold the work on three centres, as proposed by Prof. Sweet; one holding at the centre of one end, and the others opposite one another, by the other end. With such a rig, both sides can be made absolutely parallel, even though the heights of the centres may not be the same.

RULES FOR CONDUCTING BOILER TESTS.

—o—

BY WILLIAM KENT, M. E., NEW YORK.*

My object in bringing this paper before the members of the American Society of Mechanical Engineers is not to add to their store of knowledge of a subject on which most of them are already well informed, but to open a discussion which may eventually lead to the adoption of a set of rules for conducting boiler tests which may be generally accepted among engineers as a standard code of practice.

The necessity for such standard rules is becoming apparent, as greater attention is being paid to economy of fuel, and as there is greater competition among builders of steam boilers and engines to supply the demand for such economy. Hitherto there have been no such rules, and every engineer who makes a boiler test makes a rule for himself, which may be varied from time to time to suit the convenience or interests of the party for whom the test is made.

As a result of the confusion of methods of making tests there is a great lack of concord ance of results in tests of the same boilers when made by different engineers. Reports of tests are frequently made, and sometimes published, in which the evaporation of water per pound of fuel is greater than is theoretically possible in a perfect boiler. Communications often appear in the engineering and industrial weekly press which show that there exists a serious doubt in many minds of the accuracy of boiler tests which are made, even by eminent engineers.

The advisability of the adoption of a standard method of boiler testing has been felt abroad as well as in this country. Two societies in Germany, the Union of German Engineers and the Central Union of Associations for the Care of Steam Boilers, recently appointed a joint committee, which drew up a code for the testing of steam boilers and engines, an abstract of which is published in the "American Engineer" of August 24th and 31st, 1883. The German Code is scarcely such an one as is likely to find favor in this country, but it is desirable that some code be adopted here which would find general acceptance. The rules appended hereto are offered as a proposition for such a code, and the intelligent criticism of our members is requested, to the end that the rules may be amended and put into such form that they will be adopted in practice.

It is especially desirable that some standard method of starting and stopping the test should be adopted. I believe that the method preferred by the writer, and therefore included in the proposed set of rules, will be more generally criticised than any other of the rules, and, therefore, the reasons will here be given for the preference, mentioning some of the arguments for and against both this and the alternate methods.

METHOD OF STARTING AND STOPPING TESTS.

The conditions of the boiler and furnace should be in all respects the same at the end as at the beginning of a test. The steam pressure and the water level should be the same. The fire upon the grates should be the same in quantity and condition, and the walls, flues, etc., should be of the same temperature.

It is difficult to secure uniformity in all of these conditions. Several methods to secure a near approximation to uniformity may be practised, of which four methods will here be considered.

1st. Start the test when the boiler is in full working order with fires level on the grates and in ordinary working condition, and stop the test when fires are at the same height and in same condition as at the beginning.

The most serious objection to this method is that it introduces an element of guess work at the beginning and at the end of the test, both as to depth of fuel on the grate and its condition. It is difficult to estimate within an inch or two the depth of fuel on the grate with a dull fire and hard coal, but still more difficult when soft or flaming coal is used, and even if possible to estimate closely the quantity of fuel, it not possible to judge correctly of its condition as to the amount of ash it contains or as to the amount of available heating power remaining in it. For this reason I think this method of starting and stopping a test should be rejected.

2d. When the fires have burned rather low, as for cleaning, remove rapidly all the fire from the grate, and clean the ash pit, and as quickly as possible start a fresh fire with weighed wood and coal, noting the time of starting the test at the instant the fire is lighted. At the end, burn the fires low as at the beginning, and remove the whole fire, cleaning the grates, and noting the end of the test at the time when the grates are cleaned, taking note of the water level and steam pressure, which should be, as nearly as possible, the same as at the beginning.

In this method an error is introduced both at the beginning and at the end. While there is no error in the estimation of the quantity of fuel used, a serious portion is wasted both at the beginning and at the end of the the test by radiation, and by the passing of cold currents of air through the boiler. During the operation of drawing the fire the walls of the furnace become cooled, and during the first half hour at least of the test, while the fire is being lighted, the fires are not burning as under ordinary working conditions, and probably not with usual economy of the fuel, At the end of the test, before opening the doors to clean, the walls of the furnace are very much hotter than they were in the beginning of the test, and a large portion of the excess of heat is lost, not being absorbed by the boiler before the ending of the test, but radiated during the cleaning, absorbed by the cold air which rushes in at the time of cleaning, or remaining in the walls after the end of the test. The heat remaining in the hot fuel withdrawn is also lost. The errors in this method are all against the boiler.

3d. The fires are burned low, as in the second method, but the time of starting the test is taken to be the instant just before opening the doors to clean grates. The water level and steam pressure are noted, and all the water fed from this time to the end of the test is credited to the boiler. The fires are then rapidly cleaned and a fresh fire started with weighed wood and coal, which is charged to the boiler. At the end of the test the fires are burned low as at the beginning, and the end of the test is taken to be the time at which the doors are opened to remove the coal from the grates, the water level and the steam pressure being noted at the same time.

In this method the error is that due to the cooling of the walls of the furnace by radiation and by cold currents of air during the cleaning of the grates at the beginning of the test, and also that due to imperfect combustion during the time of lighting the fresh fire; the error being always against the boiler.

In both the second and third methods the fire removed from the grates contains a large portion of unburned coal. This is sometimes picked out and its weight deducted from that of the coal fired, but such picking can never be accurately done, and the result always shows a higher than the true percentage of ash. If the boiler test is made for the purpose of determining the quality of the coal, as well as the efficiency of the boiler with such coal, the second and third methods are thus unfavorable to the coal, since there is more unburned coal removed from the grates than there would be in ordinary working conditions.

In a test in which the capacity of the boiler is an essential feature to be determined, the second and third methods also give unfavorable results, since of the total time of the test, for at least half an hour, while the fresh fire is being lighted, and again when the fires are being burned down at the close, the boiler will not give its usual capacity.

4th. At the regular time for slicing and cleaning fires have them burnt rather low, as is usual before cleaning, and then thoroughly cleaned, note the amount of coal left on the grate as nearly as it can be estimated, note the pressure of steam and the height of the water level (which should be at the medium height to be carried throughout the test) at the same time, and note this time as the time of starting the test, and fresh coal which has been weighed should now be fired. The ash pits should be thoroughly cleaned at once after starting. Before the end of the test the fires should be burned low just as before the start, and the fires cleaned in such a manner as to leave the same amount of fire, and in the same condition, on the grates as at the start. The water level and steam pressure should be brought to the same point as the start, and the time of the ending of the test should be noted just before fresh coal is fired.

The principal error in this method is that of estimation of the quantity and condition of the fire upon the grates. The condition of the fire is made as nearly uniform as possible by burning down and cleaning, and the error in estimation of quantity is lessened by the fact that the quantity on the grate after cleaning is less than at any other time.

On account of the various errors and inconveniences necessarily attending the first, second and third methods of making a test, the writer is inclined to favor the fourth method. Recognizing the existence of an error of uncertain quantity in the estimation of the quantity and condition of the fire upon the grate at the beginning and end of the test, it will always be less than the unavoidable error against the boiler due to the cleaning of the grates and lighting of fresh fires, as in the second and third methods, and less than the error in estimating the thickness and condition of fires as in the first method.

Where extreme accuracy is desirable, as in a competitive test between rival boiler-makers, the fourth method will be still preferred, but then a test should be made not less than twenty-four hours long, the working to be continuous during the whole time. The longer the test the less the percentage of error.

With these preliminary observations, the proposed code of rules will now be given, which are respectfully submitted to the Society for discussion.

RULES.

PRELIMINARIES TO A TEST.

I. Establish the good condition of the boiler. —Have heating surface clean inside and out, grate bars and sides of furnace free from clinkers, dust and ashes removed from back connections, leaks in masonry stopped, and all obstructions to draught removed. See that the damper will open to full extent, and that it may closed when desired. Test for leaks in masonry by firing a little smoky fuel and immediately closing damper. The smoke will then escape through the leaks.

II. See that the blow-off valve is perfectly tight, and that there are no leaks of water from the boiler. During the test the blow off pipe should remain exposed, and any water which escapes from it should be measured, or preferably it should be closed by a cap.

III. See that there is no other feed pipe connected with the boiler than the one which delivers the measured water, also that all connections with other boilers, either in water or steam spaces, are stopped with blind flanges. If an injector is used it must receive steam directly from the boiler being tested, and not from a steam pipe, or from any other boiler.

All connections to or from the boiler should be broken except those in use during the test. Then if both pump and injector are attached to the boiler, the one or the other should be disconnected.

IV. See that the steam-pipe is so arranged that water of condensation cannot run back into the boiler. If the steam-pipe has such an inclination that the water of condensation from any portion of the steam-pipe system may run back into the boiler, it must trapped so as to prevent this water getting into the boiler without being measured.

V. Have an understanding with the parties in whose interest the test is to be made as to the character of the coal to be used. The coal must be dry, or if wet, a sample must be dried carefully and a determination of the amount of moisture in the coal made, and the calculation of the results of the test corrected accordingly.

Wherever possible the test should be made with standard coal of a known quality. For that portion of the country east of the Allegheny Mountains, anthracite egg coal, or Cumberland semi-bituminous coal should be taken

* Read before the American Society of Mechanical Engineers at Pittsburgh, May 21, 1884.

as the standard for making tests. West of the Allegheny mountains and east of the Missouri River, Pittsburgh lump coal should be used.*

VI. In all important tests a sample of coal should be selected for chemical analysis.

VII. Establish the correctness of all apparatus used in the test for weighing and measuring. These are:

(1) Scales for weighing coal, ashes and water.

(2) Tanks, or water meters for measuring water.

(3) Thermometers and pyrometers for taking temperatures of air, steam, feed water, waste gases, etc.

(4) Pressure gauges, draught gauges, etc.

VIII. Measure and record the dimensions, position, etc., of grate and heating surfaces, flues, chimneys, etc.

IX. Before beginning a test, the boiler and chimney should be thoroughly heated to their usual working temperature. If the boiler is new, it should be in continuous use at least a week before testing, so as to dry the mortar thoroughly and heat the walls.

STARTING AND STOPPING A TEST.

A test should last at least ten hours of continuous running, and twenty-four hours whenever practicable. The conditions of the boiler and furnace in all respects should be, as nearly as possible, the same at the end as at the beginning of the test. The steam pressure should be the same, the water level the same, the fire upon the grates should be the same in quantity and condition, and the walls, flues, etc., should be of the same temperature. To secure as near an approximation to exact uniformity as possible in conditions of the fire and in temperatures of the walls and flues, the following method of starting and stopping a test should be adopted:

At the regular time for slicing and cleaning fires have them burnt rather low, as is usual before cleaning, and then thoroughly cleaned; note the amount of coal left on the grate as nearly as it can be estimated; note the pressure of steam and the height of the water level (which should be at the medium height to be carried throughout the test), at the same time; and note this time as the time of starting the test; and fresh coal which has been weighed should now be fired. The ash pits should be thoroughly cleaned at once after starting. Before the end of the test the fires should be burned low, just as before the start, and the fires cleaned in such a manner as to leave the same amount of fire, and in the same condition, on the grates as at the start. The water level and steam pressure should be brought to the same point as at the start, and the time of the ending of the test should be noted just before fresh coal is fired.

DURING THE TEST.

1. Keep the conditions uniform.—The boiler should be run continuously, without stopping for meal times or for rise of pressure of steam due to increased demand for steam. The draught being adjusted by means of the damper to the rate of coal combustion desired before the test is begun, it should not be changed during the test.

If the boiler is not connected to the steam-pipe with other boilers, an extra outlet for steam should be provided, in case the pressure should rise to that at which the safety valve is set; and in case of such rise of pressure it should be reduced to the desired point by opening the extra outlet without checking the fires.

If the boiler is connected to a main steam-pipe with other boilers, the safety valve on the boiler being tested should be set a few pounds higher than those of the other boilers, so that in case of a rise in pressure the other boilers may blow off, and the pressure be reduced by closing their dampers, allowing the damper of the boiler being tested to remain open, and firing as usual.

All the conditions should be kept as nearly uniform as possible, such as force of draft, pressure of steam, and height of water. The time of cleaning the fires will depend upon the character of the fuel, the rapidity of combustion, and the kind of grates. When very good coal is used, and the combustion not too rapid, a ten-hour test may be run without any cleaning of the grates, other than just before the beginning and just before the end of the test. But in case the grates have to be cleaned during the test, the intervals between one cleaning and another should be uniform.

2. Keeping the records.—The coal should be weighed and delivered to the firemen in equal portions, each sufficient for about one hour's run, and a fresh portion should not be delivered until the previous one has all been fired. The time required to consume each portion should be noted, the time being recorded at the instant of firing the first of each new portion. At the same time the amount of water fed into the boiler should be accurately noted and recorded, including the height of the water in the boiler, and the average temperature of feed and pressure of steam during the time. By thus recording the amount of water evaporated by successive portions of coal, the record of the test may be divided into several divisions, if desired, at the end of the test, to discover the degrees of uniformity of combustion, evaporation, and economy, at different stages of the test.

When the pressure of steam and temperature of feed are nearly constant, half-hourly observations of each will be sufficient; but when there is considerable variation, observations should be made more frequently, and the figures recorded should be the averages for each interval of time rather than the figures which are observed at the end of the interval.

3. Priming tests.—In all tests in which accuracy of results is important, calorimeter tests should be made of the percentage of moisture in the steam, or of the degree of superheating. At least ten such tests should be made during the trial of the boiler, and the final records of the boiler test corrected according to the average results of the calorimeter tests.

On account of the difficulty of securing accuracy in these tests, the greatest care should be taken in the measurement of weights and temperatures. The thermometers should be accurate to within a tenth of a degree, the scales on which the condensed steam is weighed to within one hundredth of a pound.

REPORTING THE TEST.

The final results should be recorded upon a properly prepared blank, and should contain the following items:

1	Heating surface	sq. ft.
2	Grate surface (ft. in. long x ft. in. wide)	sq. ft.
3	Ratio heating to grate surface	
4	Kind of fuel used	
5	Duration of test	
6	Average steam pressure	lbs.
7	Average temperature of feed	deg.
8	Pounds of coal burned	lbs.
9	Pounds of refuse	lbs.
10	Pounds of combustible	lbs.
11	Per cent. of refuse	per cent.
12	Coal burned per sq. ft. grate per hour	lbs.
13	Total water evaporated	lbs.
14	Water evaporated per hour	lbs.
15	Water evaporated per sq. ft. heating surface per hour	lbs.
16	Water evaporated per lb. Coal—Actual Conditions	lbs.
17	Water evaporated per lb. Combustible Actual Conditions	lbs.
18	Water evaporated per lb. Coal—From and at 212 deg.	lbs.
19	Water evaporated per lb. Combustible from and at 212 deg.	lbs.
20	Quality of steam. (Moisture or superheating),	
21	Rated horse-power (Builder's rating)	H. P.
*22	Horse-power developed at 30 lbs. of water evaporated per hour from and at 212°	H. P.
23	Per cent. above (or below) rated capacity	per cent.
24	Temperature of boiler room	deg.
25	Temperature of flue gases	deg.
26	Force of draught in inches of water	inches.

* The customary method of rating horse-power is 30 lbs. of water per horse-power per hour from a feed water temperature of 212 deg. into steam at 70 lbs. pressure above the atmosphere, which is equal to 30.985 lbs. from feed at 212 deg. int steam of the same temperature. The writer prefers the calculations both of economy and horse-power to be made on the basis of evaporation from and at 212 deg., for the sake both of uniformity and of convenience in caculaltion.

* These coals are selected because they are about the only coals which contain the essentials of excellence of quality, adaptability to various kinds of furnaces, grates, boilers, and methods of firing, and wide distribution and general accessibility in the markets.

A Little Locomotive.

Henry Case, Gloversville, N. Y., has just completed the smallest locomotive ever made. It is only eight inches long and weighs only a pound and a half. The smallest locomotive heretofore made was the one exhibited at the Centennial, which was twelve inches long.

Manufactures.

PITTSBURGH parties are figuring on erecting cast-iron pipe works at West Middlesex, Pa.

THE Gardner Governor Co., Quincy, Ill., have recently booked orders for over 700 governors.

THE Leslie Sewing Machine Co., Cleveland, has increased its capital stock from $150,000 to $500,000.

THE Buckeye Sewer Pipe Co., Akron, O., contemplate erecting terra cotta works, according to the Akron Beacon.

A BUILDING 300 feet long and costing $25,000 is to be erected at Batavia, N, Y., for the Post Sewing Machine Co.

THE Crecceent Manufacturing Co., Cleveland, have lately filled orders for their flue cleaner from England, Austria and Switzerland.

THE new rod mill of the Cleveland Rolling Mill Co. made the largest run on record, May 27, viz.: 118,210 pounds of rods.

THE Manning Novelty Co. will erect an extensive plant during the summer ready for occupancy in the fall.—[Youngstown News-Register.

CITIZENS of Sharon, Pa., have raised the $25,000 necessary to secure the removal of Cassiday & Co.'s steel works, Pittsburgh, to the former place.

JAMES WESTERMAN, Sharon, Pa., will erect a model rolling mill at Corning, N. Y., probably removing his mill at Lockport, N. Y., to Corning for that purpose.

MONDAY afternoon the Fuel Gas Co., awarded to the Pennsylvania Tube Co. a contract for 40 miles of eight-inch wrought iron tubing.—[American Manufacturer, Pittsburgh.

WM. J. BITTER'S Plating Works, Toledo, O., have been running since 1876. Mr. Bitter is a practical mechanic and inspects all work before it leaves his shop. He uses steam power.

THE two lathes recently put in by the Cummer Engine Co., Cleveland, are five-foot lathes, and the boring machine has a capacity to turn a pulley 20 feet in diameter by five-foot face.

MR. GEO. W. LORD, of 316 Union street, Philadelphia, calls attention to his preparation for removing scales from boilers. He guarantees to remove and prevent boilers from scaling, or money refunded, and his offer is surely very liberal.

THE Lechner Manufacturing Co., Columbus, O., have recently made large shipments of their roller detachable chain elevators, conveyors and driving belts to Wisconsin, Pennsylvania and New York. Their chains are rapidly coming into general use throughout the country. Owing to the peculiar construction the chain has great strength and is very durable.

THE Pennsylvania Railroad Co. have just placed their order for an automatic engine with the Cummer Engine Co., Cleveland, after a thorough investigation of the various automatic engines by two sets of their best experts who visited the different manufactories and examined the engines in operation and in course of construction, both sets reporting in favor of the Cummer.

LODGE, BARKER & Co., Cincinnati, O., have now caught up with their orders and can deliver their monitor turret square arbor hand speed and engine lathes on short notice, having some ready for shipment and others in course of construction and ready for quick delivery. They are just putting on the market a new 24 inch shaper. They now have orders for five of these shapers from parties who have seen them at work and who are highly pleased with them.

WORK at Springfield, O., is not as active as usual at this season. The Agricultural Machine shops usually cut their force very considerably during the Summer months, but this year the slack season has commenced earlier than usual. They have been running short time and short force for some time past. Works that generally employ 500 to 700 men are working only from 200 to 300, and those only on short time. The Champion Machine Co. have recently received an order for 1,000 machines, on the strength of which the men are working full time, but the number has not been increased. The engine works of Leffel & Co. are only working three days per week.

Market Review.

OFFICE OF IRON TRADE REVIEW.
CLEVELAND, FRIDAY EVENING, May 30, 1884.

IRON ORE.

The ore market is not active, but sales of 100 ton lots for present, and from 1,000 ton to 5,000 ton lots for future delivery continue to be made. The depressing influence of the wages question has continued to exert itself on the market, and if the scale be signed an increased activity will be looked for after the first of June. Lake feights continue weak with no change since last week. Receipts of ore at Cleveland the past week amount to 28,480 tons, shipments 16,899 tons against receipts of 24,800 tons, and shipments of 18,793 tons last week. We quote:

No. 1 Specular and magnetic Bessemer Ores per ton	$5.50@ 6.50
No. 1 Specular (non-Bessemer) ores per ton	5.00@ 5.50
Bessemer Hematites	4.75@ 5.00
Non-Bessemer Hematites	4.25@ 4.75
Menominee Range Bessemer	5.15@ 6.00
Menominee Range non-Bessemer	4.00@ 4.70

PIG IRON.

The pig iron market exhibits the same lack of life which has characterized it for some time past. The demand continue light, and sales are only effected by persistent drumming and liberal concessions from quotations. By the grace of the coke syndicate the furnacemen will not pay an advanced price for coke during the month of June. The same restricted output is to be continued, however. Receipts of pig iron at Cleveland the past week amount to 2,226 tons, shipments 187 tons, against receipts of 2,894 tons, shipments of 496 tons last week. We quote f. o. b. cars at Cleveland, four months, premising that concessions are made from these quotations to effect sales;

CHARCOAL PIG IRON.

No. 1 Lake Superior charcoal	$22.50@23.00
No. 2 Lake Superior charcoal	22 50@23.00
Nos. 3 and 4 Lake Superior	23 00@23.50
Nos. 5 and 6 Lake Superior	23.00@23.50
Nos. 1 2, 3. 4, 5, Salisbury	34.50@36.00
Southern Car Wheel	27 50@32.00

BITUMINOUS AND COKE IRON.

No. 1 foundry, all lake ores	$20.00@21.00
No. 2 same	19.00@20.00
No. 1 foundry, lake ores, with cinder mixture	19.00@20.00
No. 2 same	18.00@19.00
No. 1 foundry, native Ohio ores	20.00@20.75
No. 2 same.	18.00@19.50
No. 1 silvery, native Ohio ores	20.25@21 00
No. 2 same	17 00@19.00
No. 1 gray forge, red short	17.50@18.50
No 1 gray forge, neutral	16.50@17.50
No. 1 Bessemer	20.00@21.00

MANUFACTURED IRON.

The market has been decidedly quiet the past week. Manufacturers and consumers are both waiting with some degree of anxiety the settlement of the wages question. During the lull but little business is being transacted, and prices are not firm. While we quote iron at $1.80 and some sales of small lots are made at that figure, still concessions of 5 cents and possibly 10 cents are made from that quotation to effect large sales. The volume of business in the local market for May, while it has not been as good as some previous months, and very much below that for the same month last year, is a just cause for satisfaction to the manufacturers when the general business depression is taken into consideration.

NAILS.—The manufacturers are receiving a fair amount of orders for nails, but prices are weak.

WROUGHT PIPE.

The situation remains unchanged.

SCRAP IRON.

Some scrap is being sold, but prices are weak.

METALS.

The market is very quiet, consumers buying only limited quantities and for immediate wants.

HARDWARE.

The volume of business has been considerably less the past week than the preceding one. A fair movement still continues, however. There is no pressing demand for any special line of goods, and stocks, though light, are well assorted and sufficient to supply any probable demand. Collections are fair. Prices are unchanged.

COAL.

Trade is quiet. Prices remain unchanged.

CINCINNATI PIG IRON MARKET.

[Reported for IRON TRADE REVIEW by E. L. Harper & Co.]

There is no marked change in the market since our last report. Business generally is dull, but there is an undercurrent of silent activity in Iron that is moving perhaps the bulk of the visible supply and relieving the market sufficiently to preclude a plethoric condition. The close of next week will determine the wage issue between the Rolling Mill proprietors and their employes, and the result of the conferences must be a matter of conjecture simply. The ability of the mills to pay the scale demanded is not considered by the workmen; their attitude like that of the stove molders, would indicate that the great enterprises they are employed in, should be run solely for their lucrative compensation. The stove manufacturers are solidly determined to conduct their own business, and have closed their doors against the union as a union. Aside from these labor agitations the Iron industries of the country, though confessedly depressed, are not in a desperate condition at all, and with good crops assured and confidence in monetary circles restored, a better feeling will prevail, and buying will be more liberal, and should the Rolling Mills continue running the demand for Pig Iron will necessarily be increased as the stocks in the mill yards are very light. We quote as prices current (May 26):

FOUNDRY.—Hanging Rock Charcoal, No 1, $22 25@$23 25; Hanging Rock Charcoal, No. 2, $21 25@$22 25; Strong Neutral Coke, No. 1, $18 00@$19 00; Strong Neutral Coke, No. 2, $17 00@$18 00; American Scotch, No. 1, $18 00@$19 50. GREY FORGE.—Neutral Coke, $16 50@$17 00. Cold Short, $16 00@$16 50; CAR WHEEL AND MALLEABLE—Hanging Rock, Strictly Cold Blast, $26 75@27 25; Hanging Rock Warm Blast, $24 00@$24 50; Lake Superior, Charcoal all grades $24 00@25 00; Southern Car Wheel Strictly Cold Blast, $26 00@$26 50.

Reported for IRON TRADE REVIEW by Rogers, Brown & Co.

The iron maket has sustained itself well under the trying circumstances of the past two weeks. It is hard to see that the financial troubles in the East have produced the least effect on prices. Demand is confined almost entirely to present needs, but this is only a combination of the policy of buyers for months past. An occasional trade is heard of, of a partly speculative nature where buyers have availed themselves of favorable offers and taken in considerable blocks of iron for future use; but with few exceptions there is no pressure to sell and no accumulation of stocks. Most of the large commission houses have practically, if not wholly, withdrawn from the selling field for the present, contenting themselves with filling the orders that come in by mail. It is generally thought that by mid-summer, when the question of a strike among the rolling mills has been settled, and more is known with regard to the growing crops, the market will take a more definite shape and there will be an improved feeling. All branches of the iron trade are generally in a sound and healthy condition and figure but little in the daily reports of business failures. We quote for cash f. o. b. car Cincinnati (May 26):

Hot Blast Foundry.—Hanging Rock Charcoal, No. 1, $21 50@$23 00; Hanging Rock Charcoal, No. 2, $19 50@22 00; Southern Charcoal, No. 1, $20 00@$20 50; Strong Coke, No. 1, $18 50@19 00; Strong Coke, No. 2, $17 25@$17 75; Strong Coke No. 3, $17 00@$17 25; Soft Stone Coal, No. 1, $18 50@$19 25; Soft Stone Coal, No. 2, $17 00@$17 75. Forge—Strong Neutral No. 1, mill 16 00@$16 00; Cold Short No 1 mill, $15 00@$15 50 Car Wheel Malleable—Hanging Rock Cold Blast $30 00@$31 00; Hanging Rock Warm Blast $20 00@$24 00; Southern Car Wheel Iron $24 50@$26 00; Lake Superior Car Wheel Iron, $24 00@$24 50; Lake Superior Malleable Iron, $24 50@$25 50.

LOUISVILLE PIG IRON MARKET.

Reported for the IRON TRADE REVIEW by Geo. H. Hull & Co.

The market continues quiet, and dull in prices; but many of the foundries are doing a large amount of work, buying a fair share of Pig Iron, and sales in consequence foot up very satisfactorily. We quote for cash in round lots as below (May 28):

PIG IRON.—Southern Coke No. 1, Foundry, $18.50@$19.00; Southern Coke No. 2, Foundry, $17.00@17.50; Hanging Rock Coke, No. 1, Foundry, $19.00@$19 50; Hanging Rock Charcoal, No. 1, Foundry, $22.00@$23.50; Southern Charcoal, No. 1, Foundry, $19.00@$21 00; Silver Grey, different grades, $15 50@17.50; Southern Coke, No 1, Mill, Neutral, $16.00@$16.50; Southern Coke, No. 2, Mill, Neutral, $16.00@16.50; Southern Coke, No. 1, Mill, Cold Short, $15.25@$15.75; Southern Charcoal, No. 1, Mill $16.00@$18.00; White and Mottled, different grades, $14.00@$14.50; Southern Car Wheel, Standard Brands, $26.00@$27.00; Southern Car Wheel, Other Brands, $22.00@$24.00; Hanging Rock, Cold Blast, $27.00@$28.00; Hanging Rock, Warm Blast $21.00@$23.00.

OILS.

Pure Oils. p'kages included			
Sperm, winter bleached per gal	1 25@1 30	Linseed oil, raw	59@62
Whale, winter bleached per gal	73@76	do do boiled	62@65
Straits	51@54	Cotton seed oil white	50@55
Bank	50@53	do do yellow	49@54
Lard oil extra W S	70@75	West Virginia lubricating 28 deg	12c@15c
do No 1 do	60@65	Paraffine oil winter pressed	18@25
do No 2 do	58@60	Capitol Cylinder	75
Tallow oil	68@73	Model do	60
Neatsfoot oil pure	95@$1 00	Eldorado Engine	45
do No 1	80@85	Turpentine, per gal	43

COAL,

WHOLESALE.

Wholesale f.o.b. cars at Cleveland:

Carbon Hill and Monday Creek	$2 50	New Hazelton, mix	1 20
Massillon	2 65	" " nut	2 00
Palmyra, lump	3 00	Connotton	2 25
Brier Hill	3 00@3 25	Connotton, mix	1 20
Pittsburgh	3 00	" nut	2 00
Salineville	2 25	Anthracite grate	5 04
Tuscarawas	2 25	Anthracite egg	5 13
New Hazelton	2 50	Anthracite stove	5 36
		Anthracite chestnut	5 26

RETAIL.—Delivered.

Massillon Lump	3 65	Palmyra, ump	4 00
" Nut	$3 25@3 40	New Hazelton	3 50
Carbon Hill and Monday Creek, lump	3 50	Connotton	3 00
Carbon Hill and Monday Creek, nut	3 25	75c less on cars by car load.	
Straitsville, lump	3 40	Anthracite Stove and Chestnut	6 00
Straitsville, nut	3 15	Egg and grate	6 75

LAKE SUPERIOR IRON ORE.

Weekly Record of Shipments from the Various Mines

Marquette (Mich.) Mining Journal.

Below will be found a tabulated statement of lake shipments of iron ore and pig iron from the ports of this district, up to, and including, Wednesday, May 21st:

ESCANABA—MARQUETTE DISTRICT.

Angeline hematite	5,960
Barnum	4 250
Barnum "A"	5,860
Cambria	6,289
Cleveland	17,527
Cleveland hematite	9,686
Jackson	10,914
Jackson, South	1,489
Jackson, West	584
Mitchell	621
National	2,108
New York	153
Quartz	970
Palmer	1,677
Saginaw	925
Salisbury	3,846
Superior	6,572
Superior hematite	2,439
Winthrop	2,266
York	1,422
Total	85,558

ESCANABA—MENOMINEE DISTRICT.

Calumet	2,306
Chapin	49,050
Commonwealth	1,324
Curry	2,137
Cyclops	3,744
Great Western	1,662
Hewitt	977
Iron River	4,736
Ludington	12,481
Metropolitan	5,812
Mastodon	1,515
Norway	18,185
Northwestern	2,030
Nanaimo	1,773
Perkins	4,122
Paint River	979
Quinnesec	3,183
Vulcan	14,359
Youngstown	2,166
Total	132,538
Grand total	218,096

MARQUETTE—MARQUETTE DISTRICT.

Lake Superior	1,000
Winthrop	641
Republic	17,661
Champion	12,590
Beaufort	134
Total	32,026

L'ANSE—MARQUETTE DISTRICT.

Beaufort	840

PIG IRON.

Pioneer furnace	100
Total ore and pig iron	32,966

ST. IGNACE—MARQUETTE DISTRICT.

Lake Superior	2,479
Winthrop	1,648
Total	4,127
Ore to local points	1,391
Grand total	5,518
Total lake shipments of ore	255,089

On the corresponding date last year, there had been forwarded from the lake ports of the district less one half that amount, or 108,677 gross tons, the increase thus far the current year being 146 412 tons.

Electrical Engineers.

Following are the officers of the newly formed American Society of Electrical Engineers:

President: Dr. Norvin Green.

Vice Presidents: A Graham Bell, Charles T. Cross, Thomas A. Edison, George A. Hamilton, Charles H. Haskins, Frank L. Pope.

Managers: Charles F. Brush, William H. Eckert, Stephen D. Field, Elisha Gray, Edwin J. Houston, C L. Billings, Frank W. Jones, George B. Prescott, W. W. Smith, W. P. Trowbridge, Theodore N. Vail, Edward Weston.

Treasurer: Rowland R. Hazard; Secretary: Nathaniel S. Keith.

THE IRON TRADE REVIEW reaches one of the most prosperous industrial districts in the world.

Cleveland Wholesale Prices.

[The lowest quotable prices are given in all cases.]

HARDWARE.

Adzes.

Carpenter's	per doz $18 40
Ship " "	18 75
Heavy railroad " "	19 50

Axes.

	per doz.
James' 2d qual	$7 00
Buckeye	7 75
" doub. bitt	15 00
Hunt's	9 50
Mann's	8 00
Eppinett's Crown Cut More	8 50
Peck's Double Bit	9 00
"Champion Blade	22 00
Good triple silver steel	11 00
	11 50

Axles.

Standard list,
Nos. 1 to 6, 60 off
Nos. 7 to 14, 60 & 5 off
Nos. 15 to 18, 60 off
Nos. 19 to 22, 60 & 10 off

Anvils.

	per lb.
Eagle, Amer	10c dis 20
Wright's	10¾c@11c
Armitage's Mouse Hole	9¾c@9¾c
Trenton	10¾c
Wilkinson's	10¾c

Anvil Vise and Drill.

Millers Falls Co. $18 ..... dis 20
Cheney Anvil and Vise dis 25&2

Augurs and Bits.

C S cut augers	dis 60
do do do bits	60
D C gimlet do Ives	dis 50
Snells bits	dis 60
Russell Jennings' augers, new list	dis 25
Cook's pat augur	40&10

Animal Pokes.

Akron	$ 3 50
Camp's	4 00
Berea, per doz	4 00
Eagle, per doz	5 00

Apple Parers.

Domestic & Reading ℔ doz. $7 00
Turn Table 4 50

Axle Grease.

Frazier's, per gross	$10 00
Common, "	6 00

Bolts.

Carriage com, old list	80&20
Tire, common, old list	80&20
Eagle carriage bolts	70
Philadel. " "	75
Stove bolts	50
Plow bolts	40
Machine	75
Cast iron barrel bolts	55&10
Wr't " " "	55&10
Cast iron chain bolts	65&10
Wr't iron sq'r bolts	55&10
Wr't shutter bolts	55&10
Ives' pat. door bolts	50
Sargent's list	
Bolt Ends 16c. per lb net	75
Cast Iron Barrel Shutter, etc	dis 55&10
Wrought Barrel	dis 55&10
Wrought Square	dis 55&10
Wr'g't Shut'r, all iron, Stanley's list	dis 50&10

Bright Wire Goods.

List June 5th, 1883 ..... 70&10

Bellows.

	Dis
Hill,s	40 pr cent
Bl'ksmith's com new list, 50 ℔ ct	
Moulder's new list, dis 25 ℔ ct	
Hand, new list, 25 per cent	

Butts.

	Dis
Wrought brass	75
Cast, loose joint	60&10
Pin, loose	60&10
Wrought, fast joint narrow	60
Wrought fast joint broad	60
Wrought loose joint broad	60
Wrought table and back flaps	60
Loose joint, without acorns	60

2 per ct. extra dis for cash.

Boiler Tubes.

"National" Standard Gauge 1 inch to 10 inch ..... dis 37½
"National" Standard Gauge 11 inch to 15 inch ..... dis 25
"National" Special Locomotive Tubes ..... net list

BoilerMakers' Tools.

Doty's Power Shears	net list
" Hand Lever Shears	net list
" Power Punch	net list
" Hand Punch	net list
Steel Screw Punch	net list
Iron Screw Punch	net list
Boiler Plate Rolls	net list
Buffalo Forges & Blowers	dis 20
Watson's " "	net list
Spring Tube Expander	dis 15
Roller Tube Expander	net list
National Tube Cleaner	dis 20
Wire Flue Brushes	net list
Anvils—'Peter Wright' 12¼ ℔ lb	
Solid Box Vises	net list

Bag Holders.

Sprengle's Pat, $18.00 per doz
40 per cent. dis.

Charcoal Iron

4½ inch, per doz	2 50
5 do do	3 50
6 do do	4 50
7 do do	5 50

Planished Amer. Russia Iron

4½ inch per doz	5 00
5 do do	6 50
6 do do	8 50
do do	9 50

Discount 33⅓ per cent

Cleveland Stamped Elbows

Genuine Russia Iron

4½ inch, per doz	5 50
5 do do	7 50
6 do do	9 50
7 do do	11 00

Chisels.

Hot and cold cutting	℔ lb 30
Railroad track	30
Machinists	30
Mallet head	50
Jape	50
Packing	50
Stone cutters	50

Crowbars.

Cast steel	℔ lb 5
Iron, steel points	4½

Cutlery, Pocket and Table.

Meriden Cutlery Co., table net
Am. Miller Bros.' Cutlery Co ..... dis 25
Humason & Beckley, pocket 33⅓
Naugatuck Cutlery Co. list net
Aaron Berkenshaw's pocket dis 25
Fram Cutlery Co., table net
Cleveland Cutlery Co ... dis 25
Miller Bros., pecket 33⅓
Akron Cutlery Co ..... dss 45

Coopers' Tools.

Bradley's	dis 15@20
Braton's	dis 15@20

Chains.

Coil by cask,

3-16	¼	5-16	⅜	7-16	½
9	7½	6 15	560	5 10	495

Drills and Drill Stocks.

Blacksmiths', each	$2.50 dis 10
Blacksmiths', self-feeding, each	7.50 dis 20
Breast, P. S. & W	dis 20&10

Drawing Knives.

Peck, Stow & Wilcox	dis 70
Witherby's	dis 65@10
Nobles Mfgr. Co	15
Adjustable handle	20

Emery and Sand Paper.

Regular Numbers	℔ lb 6c
Flour and F. F	℔ lb 4c
B. & A. Emery Paper	dis 35
Sand paper	dis 35

Enameled & Tinned Ware.

Kettles	dis 50
Sauce Pans	dis 30
Tinned Sauce Pans	dis 30

Files.

Parkin File Co	dis 40 ℔ cent
E.M. Boynton's, new list	dis 25
J. & Riley Carr	4.50 to £.
Johnson & Bro.	dis 50
Butcher's	4.50 to £.
Walter Spencer & Co.'s "Diamond"	4.50 to £.
Western	40
H. Disston & Sons (new list)	dis 40 per cent
Heller Bros.' Horse Rasps	dis 35
Nicholson	dis 40
New American	dis 40
Union File Co	dis 40
Dayton File Works	40

Grindstones.

Berea	1@1½ ℔ lb
Ohio	1¼@1⅞ ℔ lb
Nova Scotia	1¼@1¾ ℔ lb
Lake Huron	1@1½ ℔ lb

Hammers.

Maydole's	dis 15
Cheney's	new list 20&10
Hartford Hammer Co	dis 20
Humason & Beckley	dis 15
Verree	dis 5
Magnetic Tack, Nos. 1, 2, 3, $1.25, $1.50 and $1.75, dis	25&10
Nelson Tool Works	dis 40&10
Warner & Noble's	dis 5
Kip's	dis 30

Hatchets.

Buckeye	Shingling, Nos. 1, 2, 3,
℔ doz	$7 50, $8 00, $8 50, dis 40
Claw,	Nos. 1, 2, 3,
℔ doz	$8 25, $8 75, $9 25, dis 40
Lathing,	Nos. 1, 2, 3,
℔ doz	$7 50, $8 00, $8 50, dis 40

Hay Knives.

Lightning ..... per doz. net $18
Wadsworth 33⅓

Hinges.

Champion double acting spring hinges	dis. 30
Screw & Strap 6@12 in.	4c
" " 14 in. & larger	3c
Gravity Locking Blind Hinges, Sargeant & Co.	70&10
Clark & Co	70&10
Strap and T Hinges	60&10

Locks.

Whipple Mfg Co	60
Norwalk Lo Co	60

Nails.

10 to 60d	$2 40
8 and 9d	25
6 and 7d	50
4 and 5d	75
3d	1 50
2d	2 75
3d fine	3 00
2d fine	3 75
⅞ inch	3 00
3d barrel	1 00
1¼ inch barrel nails	1 50
1½ do do do	1 75
1" do do do	2 50
⅞ do do do	3 00
Cut spikes, all sizes	25
Clinch nails, all sizes	1 75
Casing and box nails	75
Finishing nails, 3 in.	$1 35
Tobacco nails,	50

Nuts and Washers

Nuts, square	8c off list.
Nuts, hexagon	9c. off list.
Washers	7c off list.

Nuts, Bolts, etc.

Machine Bolts	dis 75
Bolt Ends	dis 75
Boiler Patch Bolts	net list

Picks.

Railroad, 4 to 5 lbs. doz	$6 60
5 to 6 lbs.	7 20
to 7 lbs.	7 80
7 to 8 lbs. doz	8 40
Railroad Tamping Pick 7 to 8 lbs. doz	10 80
Mill Picks per lb	75c

Planes.

Ohio Tool Co	dis 20
Sciota	dis 25
Bailey's Pat. Adjstbl	edis 20@10
Sandusky, fancy	dis 15
Buckeye	dis 20
Ogontz	dis 25

Plumbers', Steam and Gas Fitters' Supplies.

Wrought Iron Pipe now list and dis
Gas Pipe—

New List ⅛ to 1¼ black	27½ dis
galv'd	17½ dis
1½ and larger black	47½ dis
galv'd	32½ dis
Malleable Iron Fittings	25
Grey Iron Fittings	dis 50
Steam Brass Goods	dis 55
Water " "	dis 50
Ludlow Gate Valves	dis. 20
Register Gauge Cocks net	1 00
Montg'ry Gauge Cocks	$1 each
Steam Gauges	dis. 40
Steam Guages 5 in. net dial per doz	30 00
Scotch Glass Tubes	dis. 70
Tools	special.
Duplex Injectors	net.
Soil Pipe & Fittings, Mott's List	dis. 30
Sinks, Mott's List	dis. 25
Copper Bath tubs, sinks, etc	dis. 25
Galvanized Iron Boilers "Scaifes,"	dis. 50
Marble Slabs, Counter-sunk net per ft	$ 1 25

Tinners' Tools & Machines.

Machines (P. S. & W.)	less 10
Tools (P. S. & W.)	" 20

Rivets.

Iron	dis 40
Tinned	dis 40
Copper	dis 40 & 10

Rules.

Stanley ..... dis. 70 & 10

Shovels and Spades.

Ames' new list, July 1, 1881,	dis 17½
Old Colony	dis 17½
Remington's (Lowman's Patent)	dis 30
Bishop	dis 50
Chisholm	dis 33⅓
Rowland's	dis 50
Griffiths	dis 50

Screws.

	Dis
Flat head iron or steel [new list] per cent dis.	75
Flat head brass	70
Round head iron or steel	65
Round head brass	60
Brass and Silver capped	50
Japanned, list of Plain Screws	40&10
Coach, patent Gimlet point, list per 100	70
Lag, taper points	70
Bed	10
Machine, flat head, iron. round head, iron	55 50
Bench, iron	55&10
wood, beech, per doz $3	10
wood, hickory	20&10

Saws.

Disston	dis 20
Disston's Circular	dis 40
Disston's hand panel, rip, &c	dis 20
Boynton's lightning cross cut new list	dis 40
Boynton's circular and mill	dis 40
Boynton's ice	dis 25
Boynton's lightning hand panel and rip	dis 25
Livingston's butcher and kitchen	dis 20
Livington's framed wood Nos. 101 102 103 104 105 doz $10 8 50 10 7.50 6 20	net
Peace circular & mill	dis 40
Peace hand panel and rip	dis 25
Peace band saws, all widths	dis 10

Scales.

Hatch, Counter, No. 171 ℔ doz. $42,	dis 45
Union Platform	$6, dis 45
Fairbanks'	dis 25
Buffalo Scale Co	dis 40
Forsyth Scale Co	dis 30
Howe's	dis 20&10
Chatillon's Eureka	dis 25
Family Universal	dis 50
Scale Beams	dis 40&10

Sheet and Tank Rivets.

"Norway."

All sizes ..... dis. 15

Boiler Rivets—"Albany."

¼, ⅝, 11-16, and ⅞ in. diam. 4 00
"Standard" ½, ⅝, 11 16 and ⅞ inch diameter. 4 00

Sad Irons.

From 4 to 10 lbs.	per lb 3 net
Self-Heating	℔ doz $9 net
" Tailors	℔ doz $18 net
Gleason's Shield and Toilet	dis 25
Mrs. Pott's Irons, double pointed	dis 35
Mrs. Pott's Irons, square back	dis 35
Enterprise Star Irons	dis 35
Combined Fluter and Sad Iron	℔ doz $15, dis 15

Squares.

	D.s
Steel or iron, case lots	55
Try squares and T bevels	40

Spikes—WROUGHT

All lengths by ⅛ inch	3½c
do do do 5-16	3
do do do ¾, 7-16 & ½ in	2¾

Tacks, Brads, &c.

New List Sept. 1, 1882.

Tinned Swedes tacks	dis 30
" American "	30
Swedes tacks, all kinds	30
American cut tacks	30
Copper tacks and nails	30
Swedes Hungarian nails	35
Gimp and lace tacks	30
" " " tin'd	30
Furnishing nails	25
Trunk and clout nails	25
Common and pat. brads	25
Basket nails	20
Brush tacks	20
Leathered carpet tacks	20
Cigar box nails	20
Chair nails	20
Double pointed tacks	40

Extra 10 per cent. on all the above.

Valves.

	Dis.
Jenkins' Patent Gate Valves	35
" " Globe	40
" Standard Packing "	20

Vises.

Solid box	45&50
Solid "Crown" (A. H. Hildick)	40 to 100 lb, 15c net
Solid, Peter Wright's	15¼
Solid, Wilkinson's	14&15
Parallel, Parker's	dis 25
" Simpson	dis 20
" Prentiss	dis 15
Saw Filers, Hopkins' ℔ doz $17.50,	dis 10
" Wentworth's	9 00
Cowell Hand Vises	dis 20
Richardson's Vise and Anvil	dis 25

Wrenches.

Coe's genuine	50
Girard Standard	dis 50 & 10
Mechanics' 10 and 10	dis. 50
P. S. & W. Mechanics	dis 50&10
Agricultural	dis 70
Campfield & Sutliff Engineer's	50
Mechanics'	60
Agricultural	70

Wringers.

2½ inches Universal	$ 10 00
2 inches Eureka	30 00

Wire.

	New List.
Brass and Copper	dis 15
Bright & annealed, Nos. 0 @ 18	dis 67½
" " Nos. 19 @ 26	dis 67½
" Nos. 27 @ 36	dis 72½
Coppered Nos. 0@18,	dis 62½
Galvanized, Nos. @18, market list,	dis 57½
Tinned, Nos. 0 @ 18,	dis 50@52½
Cast steel	dis 55
Tinned Broom Wire, Nos. 18 @ 20	8c lb. net
22 to 22	8½c lb
Annealed Fence, Nos. 8 and 9	dis 67½
Annealed Grape, Nos. 10 to 14	dis 67½
Galvanized Telegraph, Nos. 7 to 9	6½c lb net
Galvanized Telegraph, Nos 10 to 11	℔ lb 7¼c
Galvanized Telegraph, No. 12	℔ lb 7½c
Fence staples	℔ lb 5½@5¾c
Fence Staples, galvanized,	℔ lb 6½@6¾c
Stubs Steel Wire regular	75 per lb net
Barb Wire, painted	5c
Barb Wire, galvanized	6c
Roebling's Iron and Steel Wire Rope (Roebling List)	dis 15

LEAD.

Amerc'n, ℔ lb	4¼@4½c
Bar, ℔ lb	5½c
Pipe, ℔ lb	5½c dis 10 per ct
Sheet, ℔ lb	5¾c dis 10 per ct
Tin-lined pipe	15c dis 10 per ct
Block	45c.
Chilled Shot	8c

Babbitt Metal.

Genuine, per lb., net	25c
Crescent, "	22c
Extra, "	20c
No. 1 "	15c
No. 2 "	12c
No. 3 "	9c
No. 4 "	5½c

COPPER.

Lake Ingot	14½@15c
Baltimore	14@14½c
Arizona	14@14½c

TINNER'S STOCK.

Tin.

Banca, per lb.	22
Straits	20@20½c
English "	21½c
Bar "	23c
Spelter	5@5¼c

Tin Plate,

IC 12x12 charcoal	$ 6 00
IC 14x20 do	6 00
IX 14x20 do	7 50
DC 12½x17 do	7 00
DX 12½x17 do	9 00
DXX, 12¼x17 do	11 00
DXXX, 12½x17 do	12 75
IC, 20x28 do	13 00
IX, 20x28 do	15 75
IC, 14x20, Best Roof	5 65
IX, 14x20, do	7 15
IC, 20x28 do	11 50
IX, 20x28 do	14 50
IC, 10x15 Best Coke	5 60

Subject to card discount.

Solder.

Half and Half, in bars	13¼
No. 1 do	12
Spelter Solder	22

Pat Planished Sheet Iron

(A)	per lb 10½c
(B)	" 9c

Nos	10	15	21	25
	to 14	20	24 & 26	
Com	3-10	3-30	3-40	3-75
Char	5-60	5-60	6-00	6-20

Sheets over 28 in. wide ¼c extra.

Zinc.

Sheet, cask	6¼c
Sheet, open	6½c

BRASS.

Cash prices for Roll and Sheet Brass. For less quantity than 100 lbs. add 3c per lb.

High Bra

All Nos not thinner than No 28, wider than 2 in. not wider than 14 inch 30c
All Nos to No. 28 inclusive, and widths over 14 to 20 in. inclusive 35c
All Nos to No 28, inclusive, and widths over 20 to 30 in. inclusive 38
¼c per lb advance on each No above Nos 28 to 38, inclusive.
All Brass thinner than No. 8 is Platers' Brass at 53c
Sheets 24x48, and all sheets cut to particular sizes and lengths under 30 inches, in width wider than 2 inches 37c

Low Brass.

4c pr lb. more than High Brass
Gilding metal 8c per lb. more than High Brass.
Platers' or Gold Metal

In Bars	48c
Sawed	51c
Planed or Polished	54c

For Slitting.

Metal in width in. to ¼ in. to No. 28, inclusive, 1c per lb., advance.
Metal, in width 2 in. to 1 in. thinner than No 28, 3c per lb. advance
Metal, in width ⅛ in to ¼ in. thinner than No 28, 5c per lb. advance.
Metal ¼ in. in width and less, 10c per lb. advance.
Any of the above widths cut to particular lengths add 7c per pound.
Sheathing Brazier Copper, Bolts, etc.
All sizes, 16 oz. per sq foot and over, per lb 22c
nd over per lb 22c
Brazier's Copper, ordinary sizes, under 16 oz. and over 12 oz. per sq. foot, per lb. 22c
Brazier's Copper, 10 oz and 12 oz per sq. ft ... per lb. 23c
Brazier's Copper lighter than 10 oz. per sq. ft .. per lb 32c
Circles less than 84 inches in diameter .. per lb. 33c
Circles 84 inches in diameter and over ..... per lb. 30c
Segment and Pattern sheets per lb. 33c
Locomotive Fire Box sheets per lb. 30c
Sheathing Copper, over 12 oz. per sq. ft ... per lb. 22c
Bolt Copper ..... per lb. 28c
Copper Bottoms per lb. 22c
No copper is Sheathing except 14x10 inches, and not to exceed 34 oz. to the sq. ft

Tinning.

14x48 ..... per sheet 6c
All other size sheets, 2½c per square foot For tinning th sides, double the above amou..

IRON AND STEEL.

Flat Bar.

1½ to 4 by ⅜ to 1 inch	1 80
1½ to 6 by ⅜ to 1 inch	1 90
1¾ to 6 by 1¼ to 1¼ inch	2 20
1¼ & 1¾ by ⅜ to ¾	1 90
1 & 1¼ by ⅜ to ¾	2 00
⅝ ⅞ and ⅞ by ⅜ to ⅝	2 20

Round and Square.

1 to 1¾ inch	1 80
2 to 2¾	2 00
2¾ to 3¼	2 30
3¾ to 4	2 80
4¼ to 4½	3 30
4¾ to 5	3 50

Ova..

⅞ to 1¼ inch	2.20
⅝ to ½	2 40
⅜	2 6.
⅞	3.00

Heavy Band.

1¼ to 6 by ¼ and 5-16 inch	2 00
1 to 1¾ by ¼ and 5-16 do	2 10
⅝ to ⅞ by ¼ and 5-16 do	2 30
⅜ to ½ by ¼ and 5-16 do	2 80

Half Oval and Half Round.

1½ to 3 inch	2.9
⅞ to 1¼	2.30
⅝ to ¾	3.00
½	3.30
⅜	4.80

Light Band.

1¼ to 6 by ¼ to 3-16 ..... 2 30

Hoops.

1¾ to 4, Nos. 13 to 15	2 60
1¾ to 2 " Nos 15 to 18	2 70
1¾ to 4 do 13 to 15	2 80

1-10 extra for each gauge lighter

Sheet Iron.

No 22 to 24	3 05
No 25 to 26	3 25
No 27	3 45
No 28	3 65

English Steel.

Best cast	℔ lb 16c
Extra cast	16¾c
Round machinery	10c
Swaged, cast	8c
Best double shear	15¾c
Blister, 1st quality	13c
Refined tool steel	16¼c
Spring calking	7¼@7¾c
German steel, best	11c
2d quality	10c
3d quality	9c
Sheet cast steel, 1st quality	15¼c
2d quality	14¼c
3d quality	12¾c

American Steel.

Best brands of refined cast steel, ¾ to 2 inches	12c
Crucible cast	7c
Open-hearth ditto	4¾c
Hammer cast steel	9c
Spring cast steel	5½c
Bessemer and open-hearth spring	4¼c
Ditto plow	3¾c
Bessemer machinery 5 @6c	
Spring and calking	7¼@7c
Tire	4
Sleigh shoe	4

Bessemer Steel Tire.

¾ to 1 by 3-32	3½ ℔ lb
¾ to 1 by ½ to 5-32	3¾ ℔ lb
¾ to 1 by 3-16 to ¼	3¾ ℔ lb

Boiler Plates.

"Paxton"—Standard Quality.

C. No. 1	3 00
C. H. No. 1 Shell	3 50
C. H. No. 1, 50,000	4 00
C. H. No. 1 Flange	4 10
Extra Heavy	5 50
Homo. Steel 70,00	6 50
Heads, ¼c ℔ lb. extra.	
Boiler Tubes 47½ per cent dis	
Burden Rivets	3 75

Miscellaneous Cast Steel.

Auger and auger bit	10
Axle steel for wagons	7
Frog points and plates	8
Frog size bars	8
Pick, hammered	10½
Mattock, beveled	10½
Table cutlery	9
Trap spring steel	7½
Pike and cant hook	10
Coal and granite	8½

SCRAP IRON AND OLD METAL.

DEALER'S BUYING PRICES

	Per Ton
No. 1 R R wro't scrap	$19
No. 1 wrought scrap	17 50
No. 1 Machine cast scrap	14
Stove plate (free from burnt iron)	11 00
Grate bars	8 50
Pipes and flues (clean)	15
Tank iron	14
Hoop and band iron	10
Light sheet iron	9
Axle turnings	15 00@16 00
Wro't turning (f from cast)	16
Wro't iron, oily drillings	10
Cast borings	9 00
Malleable iron	8 60
Uncut wro't iron boilers	15
Old copper per lb	10½
No. 1 H. Brass per lb	11
Heavy yellow Brass do	9@10
Light Brass per lb	7@10
Scrap Zinc per lb	2@3
Tea Lead per lb	3
Heavy Lead per lb	4
Rails	22

PIPE, WROUGHT.

Standard Wrought Iron Lap Welded Steam and Gas Pipe

	Inside Diameter, Inches.	Weight Per Foot.	Price Per Foot Black.	Price Per Foot Galvan'd
Butt-Welded.	⅛	24	03	
	¼	42	03	$0 05
	⅜	56	03½	0 05½
	½	84	04½	0 06
	¾	1.12	06	0 07½
	1	1.67	08	0 10½
	1¼	2.24	11	0 14
Lap-Welded.	1½	2 68	21	0 24
	2	4 61	26	0 30
	2½	5.74	38	0 47
	3	7 54	50	0 62
	3½	9 00	67	0 88
	4	10 66	83	1 00
	4½	12 34	1 00	1 25
	5	14 50	1 10	1 50
	6	18.76	1 50	2 00
	7	33.27	2 00	
	8	38.18	2.75	
	9	43 70	3.70	
	10	46.06	4.75	
	11	45.02	5.76	
	12	49.00	6 50	
	13	54.00	7.75	
	14	58 00	9.00	
	15		10.00	

Discount, (car load lots) butt-welded ⅛ inch to 1½ inches plain ..... 30 per cent.
Ditto galvanized 20 per cent.
Discounts (car load lots) lap-welded 1½ inches to 15 in. plain ..... 50 per cent.
Ditto galvanized 35 per cent.
Discounts on less than car lots 2½ per cent. less,
Discounts on pipe cut to specified lengths depends on size and waste.

TRAVELER'S RECISTER.

Lake Shore & Michigan Southern.

The time given is the new standard (Ninetieth meridian) time, which is thirty-three (33) minutes slower than Cleveland time.

TRAINS GOING EAST.	Arrive. From West.	Depart. For East.
Fast N. Y. Express	*1 05 a m	*12 05 a m
N.Y.,Bo'f'n & At. Ex.	*6 35 a m	*7 00 a m
Elyria Accommodation	†8 07 a m	.....
Pt.Clinton Accomd'at'n	†10 35 a m	.....
Buffalo Accommodation	†10 35 a m	†10 50 a m
N. Y and B'f'n Fast Ex.	*1 35 p m	*2 25 p m
Cincinnati and St Louis Ex	.....	2 25 p m
Conneaut Accom'dation	.....	†4 22 p m
Night Exp via Norwalk	† 9 40 p m	†10 00 p m
Night Exp via San'sky..	9 42 p m	.....
TRAINS GOING WEST.	Arrive. From East.	Depart. For West.
Fast Limited Express	*11 55 a m	*12 05 a m
Mich. Ex. via Sandusky	*2 15 a m	*2 35 a m
Chi. Ex. via Sandusky	†6 05 a m	6 30 a m
Mich. Ac. via Norwalk	.....	†6 10 a m
Conneaut Accom'dat'n	†8 10 a m	.....
Toledo Ex. via Norwalk	†12 52 p m	†3 00 p m
St. Louis Ex. via San'ky	*12 15 p m	*1 20 p m
Chi. Pac.Ex. via Nor'lk.	*6 00 p m	*12 40 p m
Pt.Clinton Accom'dat'n	.....	†4 30 p m

Sunday trains for Nottingham—Depart 8:30 a. m. and 1:45 p. m., return at 9:05 a. m. and 3:45 p. m.

Reference marks—*Daily. †Daily except Sunday. ‡Daily except Monday.

Cleveland, Columbus Cincinnati & Indianapolis.

Central standard time, 33 minutes slower than Cleveland time.

ARRIVALS.

No. 8 Col. & Cin. & Ind'polis Ex.	*6 40 A.M
No. 20 C. L. & W and Galion Exp	9 30
No. 12 St. Louis & New York Exp.	*2 00 P.M
No 2 Indianapolis & Columbus Exp	9 50
No 1 Columbus & Cincinnati Exp.	*4 45
No. 22 Wheeling Express	6 45
No. 4 Cincin New York fast line,	1 15 A.M

DEPARTURES.

No. 3 Cincinnati & Columbus Exp.	*7 30 A.M
No. 23 Cleve, Indianap.&Wheel'g Ex	6 40
No. 5 Special St. Louis & Cin. Ex.	**12 25 P.M
No. 9 Night Express,	*6 40
No. 27 C. L. & W. and Galion Exp.	4 30

**This train runs daily to Indianapolis and St. Louis, and daily, except Sunday, to Cincinnati.

Cleveland & Pittsburgh.

The time given is the central standard time, thirty-three minutes slower than Cleveland time.

	DEPART	ARRIVE
Pittsburg & Wheeling	8 00 A.M	2 12 P.M
Express	2 00 P.M	6 25
Alliance Accommodation	3 15	9 50 A.M
Ravenna Accommoda	4 50	8 12
Night Express	†11 10 P.M	5 55 A.M
Newburg Accom'dation	10 30 A.M	11 40
Newburg Accom'dation	12 00 M.	1 20 P.M

† Night Express runs daily, except Saturday, by way of Wellsville, and on Saturday by way of Alliance. All other trains daily except Sunday.

"The Nickel Plate."

Ninetieth meridian time.

Going East.	ARRIVE.	DEPART
Buffalo Accom.	10 22 a.m.	10 27 a.m.
Conneaut Accom	....	3 52 p.m.
Chicago Accom	9 02 p.m.	
Local Freight	11 36 p.m.	12 17 p.m.
Going West.	ARRIVE.	DEPART
Chicago Accom	....	6 47 a.m.
Conneaut Accom	8 57 a.m.	
Bellevue Accom	4 52 p.m.	4 57 p.m.
Local Freight	12 44 p.m.	1 22 p.m.

Rocky River Accommodation departs 5 52 a.m.; 1 47 p.m.

Euclid Accommodation departs 7 02 a.m.; 11 42 p.m., 5 17 p.m.

All trains daily except Sunday.

New York, Pennsylvania & Ohio.

New standard central, or Ninetieth meridian time, 33 minutes slower than Cleveland city time.

DEPARTURES.	a.m.	p.m.
N. Y. & Pitts. Express	* 6 50	11 00
Youngstown & Pitts. Ac	10 35	....
Fast N. Y. & Pitts. Express	....	* 2 20
Mahoning Accommodation	....	4 10
N. Y. and Pitts. Express	....	11 00
ARRIVALS.	a.m.	p.m.
New York Express	* 6 15	....
Mahoning Valley Ac	10 20	....
Fast N. Y. & Pitts. Ex	....	* 1 05
N. Y. & Pittsburgh Ex	....	* 6 30
Youngstown & Pitts. Ac	....	9 45

* Sunday trains.

Valley Railway.

Central Standard time.

	ARRIVE.	DEPART
Wheeling Junction	9 24 A.M	7 40 A.M
" "	10 40 A.M	8 40 A.M
Canton	1 48 P.M	5 47 P.M
Wheeling Junction	5 47 P.M	2 52 P.M

Special trains leave on Sunday at 8.50 P.M., arriving at Cleveland at 6.42 P.M.

Depot foot of South Water Street.

Connotton Valley Railway.

†Standard Time.

Trains arrive:	A. M.	P. M.
Canton, Sherrodsville & Coshc'ton.	9 47	7 07
Canton & Coshocton		1 02
Kent accommodation	7 37	

Newburgh 7:02 a. m., 8:32 a. m. 1:52 p. m., 4:17 p.m., 6:42 p. m., 10:07 p.m.

Trains leave Cleveland,	A. M.	P. M.
Canton, Coshocton & Sherrodsville	7 02	
Canton & Sherrodsville		2 07
Canton & Coshocton	7 02	3 42
Kent accommodation		5 12

Cleveland and Newburgh, 6:12 a. m., 7:47 a.m., 10:32 a.m., 2:52 p.m., 5:52 p.m., 5:12 p.m.

Newburgh and Bedford 10:32 p.m.

Trains Sunday only depart for Bedford 8:07 p.m., 10:07 a.m., 9:02 p.m.; Newburgh, 1:42 p m.; Kent Accommodation 5:12 p.m.

Trains arrive, Kent Accommodation 7:37 p.m. Bedford 8:42 p.m., 1:27 p.m., 5:55 p.m.; Newburgh 2:32.

Depot corner Huron and Ontario streets.

Cleveland, Akron & Columbus Railroad,

Cleveland, Akron & Columbus Railroad, running over Cleveland & Pittsburgh Railroad to Hudson, for Akron, Columbus, etc.

	ARRIVE.	DEPART.
Mail	2 30 P.M	8 25 A.M
Express	7 30	2 00 P.M
Accommodation	10 10 A.M	3 45 P.M

Cleveland, Lorain & Wheeling.

ARRIVALS.

Wheeling & Cleveland Express	6 45 P.M
Uhrichsville Express	9 10 A.M

DEPARTURES.

Wheeling & Cleveland Express	6 40 A.M
Uhrichsville Express	4 30 P.M

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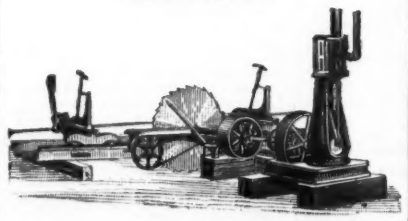

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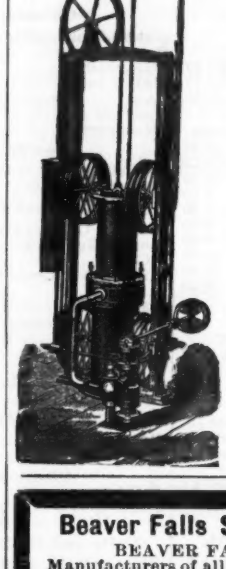

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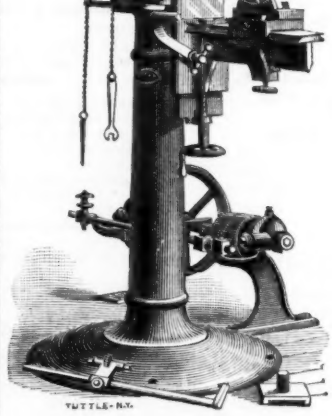

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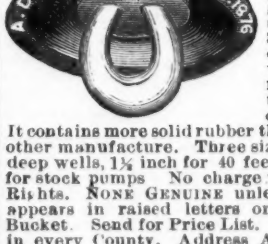

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Following is the time in effect Nov. 18, 1883, and until further notice:

GOING EAST.

	Local Pass'n'gr	Local Pass'ngr.	Coneaut Accom.
Lv. Chicago	7 45 am	.....	.....
Ar. Valparaiso	9 37	.....	.....
" Ft. Wayne	1 00 pm	.....	.....
" New Haven	1 35	.....	.....
" West Leipsic	3 45	.....	.....
" Arcadia	4 44	.....	.....
" Fostoria	4 57	.....	.....
" Gr. Springs	5 44	.....	.....
" Bellevue	6 12	.....	.....
Lv Bellevue	6 22	7 55 am	.....
Ar Lorain	7 50	9 16	.....
Ar Cleveland	9 02 pm	10 22	.....
Lv Cleveland	.....	10 27	3 52 pm
Ar Painesville	.....	11 33	5 05
" Ashtabula	.....	12 25 pm	6 03
" Conneaut	.....	1 05	6 30
" Erie	.....	2 09	.....
" Dunkirk	.....	3 47	.....
" Buffalo	.....	5 20	.....

GOING WEST.

	Local Passn'gr.	Local Pass'ngr.	Con'eaut Accom.
Lv Buffalo	.....	9 50 am	.....
Ar Dunkirk	.....	11 24	.....
" Erie	.....	1 23 pm	Leave.
" Conneaut	.....	2 20	6 15 am
" Ashtabula	.....	2 51	6 46
" Painesville	.....	3 44	7 43
" Cleveland	.....	4 52	8 55
Lv Cleveland	6 47 am	4 57	.....
Ar Lorain	7 58	6 12	.....
Ar Bellevue	9 10	9 35	.....
Lv Bellevue	9 20	.....	.....
Ar Gr. Springs	9 44	.....	.....
" Fostoria	10 22	.....	.....
" Arcadia	10 34	.....	.....
" West Leipsic	11 30	.....	.....
" New Haven	1 35 pm	.....	.....
" Ft Wayne	1 50	.....	.....
" Valparaiso	5 55	.....	.....
" Chicago	7 50	.....	.....

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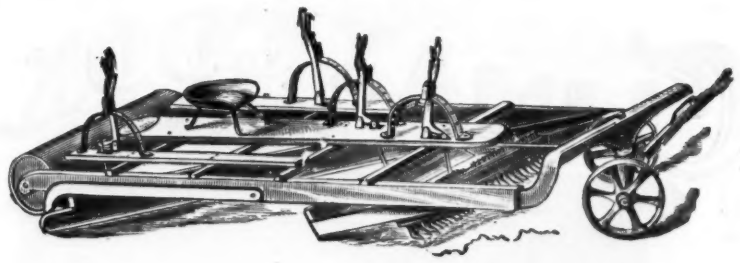

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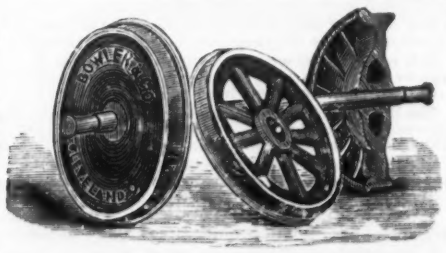

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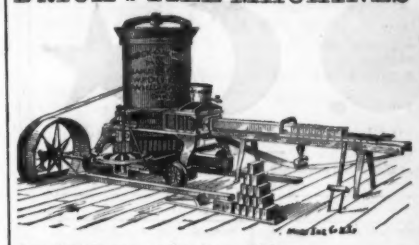

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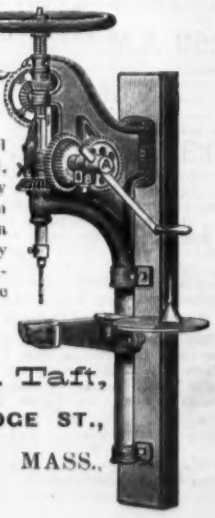
IMPROVED

DRILLS



This cut represents my No. 2 Improved Drill, double geared, so arranged that by moving the crank from A to B, it will give a slow motion, for heavy drilling, to the spindle, increasing the power double.

Price $36 00

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34 SOUTHBRIDGE ST.,

WORCESTER, MASS., U. S. A.

The Cleveland, Mt. Vernon and Delaware RAILROAD.

"Cleveland, Akron & Columbus."

In effect November 18, 1883, based on Central Standard Time.

GOING NORTH.

STATIONS.	No. 1.	No. 3.	No. 5.	No. 7.
Leave				
Columbus	6 45	11 40	.....	16 50
Westerville	7 10	12 05	.....	17 18
Centerburg	7 52	12 47	.....	18 04
Mt. Vernon	8 37 B	13 31 D	.....	18 50 S
Gambier	8 49	13 41	.....	19 01
Danville	9 09	14 01	.....	19 23
Gann	9 21	14 11	.....	19 35
Millersburg	10 14	14 59	5 30am	.....
Fredricksb'g	10 37	15 19	5 51	.....
Orrville	11 12	15 50	6 50 B	.....
Warwick	11 26	16 11	7 16	.....
Clinton	11 42	16 16	7 23	.....
Akron	12 15	16 46	7 57	.....
C'yahoga F's	12 30	16 58	8 11	.....
Hudson	12 50	17 15	8 30	.....
Ar. Clevel'd	14 12	18 25	9 50	.....

GOING SOUTH.

	No. 2	No. 4.	No. 6.	No. 10.
Leave.				
Cleveland	8 00	14 00	15 15	16 50
Hudson	9 17	15 10	16 30	18 15
Cuyahoga F's.	9 35	15 28	16 54	18 50
Akron	9 51	15 44	17 11	19 45
Clinton	10 22	16 16	17 43	.....
Warwick	10 26	16 21	17 48	.....
Orrville	10 51	16 47	18 14	.....
Fredricksburg	11 22	17 18	18 48	.....
Millersburg	11 45	17 40	19 10	No. 8.
Gann	12 32	18 30	.....	5 50
Danville	12 44	18 41	.....	6 01
Gambier	13 04	19 01	.....	6 21
Mt. Vernon	13 29 D	19 26 S	.....	6 50 B
Centerburg	14 01	20 00	.....	7 25
Westerville	14 45	20 45	.....	8 13
Columbus arr.	15 10	21 10	.....	8 40

The system used in the above table consists in avoiding the confusing division of the day into two equal portions of 12 hours each, and emp'oying instead a continuous count from 1 to 24. The days begins at Midnight, as under the common system, but there is no possibility of confusion between the forenoon and afternoon hours.

E. T. AFFLECK,
Gen. Pass. Ag't, Columbus, O.
GEO. D. WALKER, RECEIVER.
N. MONSARRAT, Gen'l Supt.

NEW YORK, PENNSYLVANIA AND OHIO RAILROAD.

New York, Boston and the East.

The shortest and quickest route to Pittsburgh, Washington, Baltimore and the Southeast.

Central or Ninetieth Meridian time, 33 minutes slower than Cleveland city time.

Until further notice trains will leave the new Central Depot, South Water Street and Viaduct, as follows:

6 50A.M. LIGHTNINGEXPRESS(daily sleepingand hotel coaches from Leavittsburg. 8:35 a.m. To New York, Albany and Boston without change. Arrives at Meadville 10:40 a.m., (dinner); Franklin, 12:08 p.m. Oil City, 12:30 p.m.; Corry, 12: 5 p.m.; Jamestown, (Lake Chatauqua) 1:35 p. m.; Buffalo, 5:50 p. m.; Rochester, 8:20 p.m.; Hornellsville, 6:00 p. m.; (supper); Corning, 7:25 p.m.; Elmira, 8:05 p.m.; Binghampton, 10:05 p.m.; Albany, 5:00 a.m.; Boston, 1:45 p.m.; arriving at New York, 6:15 a.m.

2:20P.M. LIMITED EXPRESS, Pull-Sleeper Cleveland to New York, (daily). Arrives at Meadville, 6:30 p m.; Jamestown, 8:47 p. m.; Salamanca, 9:45 p. m.; New York, 10:10 a. m.

11:00 P.M. NIGHT EXPRESS, (daily ex cept Sunday), Sleeping Coach from Leavittsburg to New York without change. Arrives at Youngstown, 1:50 a.m.; Pittsburgh, 5:50 a. m.; Washington 0:00 a. m. Baltimore 00:00 p. m.; Meadville, 3:25 a. m. Corry, 4:59 a.m.; Jamestown, 5:57 a.m.; Buffalo, 9:20 a.m.; Rochester, 12:58 p. m.; Hornellsville 11:00 a.m.; Corning, 12:07 p. m.; Elmira 0 :40 p. m.; Binghampton, 2:19 p.m.; New York 9:10 p.m.

2:20 P.M. PITTSBURGH EXPRESS, daily, through without change. Parlor Car, Cleveland to Pittsburgh, arrives at Youngstown, 5:00 p.m.; Pittsburgh, 8:02 p.m.; Washington, 7:09 a.m.; Baltimore, 8:19 a.m.

4:10 P.M. MAHONING ACCOMMODATION, stopping at all way stations. Arrives at Youngstown, 6:55 p.m; Sharon, 8:01 p.m; Sharpsville 8:10 p. m; connects at Leavittsburg with train No. 20 for Meadville and intermediate points, arrives at Meadville, 11:05 p.m. Pittsburgh, 00:00 p. m.

6:50 A.M. PITTSBURGH EXPRESS, —(daily) through without change. Arrives at Youngstown, 9:30 a.m.; Sharon, 10:30 a.m.; Sharpsville, 10:40 a.m.; Pittsburgh, 12:45 p.m. Returning, leave Pittsburgh, 4:15 a.m., 7:45 a.m., and 12:55 p. m. and 3:45 p.m.

10:35 A.M. YOUNGSTOWN& PITTSBURGH Accommodation, stopping at all Way Stations, arriving at Youngstown 1:30 p.m.; Pittsburgh, 5:45 p.m. Trains arrive at Cleveland, 6:15 a.m., 6:30 p. m., 10:30 a. m 1:05 p.m., and 9:45 p.m.

☞ This is the only route by which passengers can reach Corry, Elmira, Binghampton, New York City, and intermediate points WITHOUT CHANGE. No change to Boston and New England cities.

Baggage Checked Through to All Points East

☞ Through Tickets and information regarding the route can be obtained at the office 131 Bank street, and at newDepot of New York, Pennsylvania and Ohio Railway, uth Water street and Viaduct, Cleveland.

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Gen. Pa Agt., Cleveland, Ohio.
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The simplest, most durable and most economical Stove on the market.

Three Burners supplied with Gas from one Generator.

Correspondence solicited.

Cleveland Stove Co., Cleveland, O. Sole Manufacturers.

CLIMAX COOK

Specially Designed for the Western Market.

OVEN NO. 8—20x21¼x13 Inches. OVEN NO. 9—22x23¼x14 Inches.

Has peculiar and important features that make it the best operating stove in the market, and commend it to the favorable notice of dealers who desire a first class stove.

It is constructed with our patent flue, which descends in the rear and ascends in front between oven and fire-box, forming a wide flue around back, bottom and front of oven, insuring an easy draft and uniform heating of all parts of oven.

The Reservoir is of planished copper, with deep, stamped pit, protected with cast iron, and is effectually heated without an extra damper. By removing Reservoir and supplying its place with cover plates, a complete six-hole stove is obtained

The fire-back is in three heavy interchangeable pieces. A water-back is provided which occupies the same space as fire-back, heats perfectly and does not retard the heating of oven, for reasons of the intervening flue between it and oven.

The grate is hinged at its extreme back edge, and when dumped gives a clear opening into a large ash-pan. It can be partially dropped to remove clinkers from the front.

A receptacle for the covers, when removed from top of stove, is hung on swing bracket under front hearth.

Its neat design, nicely polished edges, nickeled panel plates and trimmings, give it a very attractive appearance.

Send for prices. ——MANUFACTURED BY——

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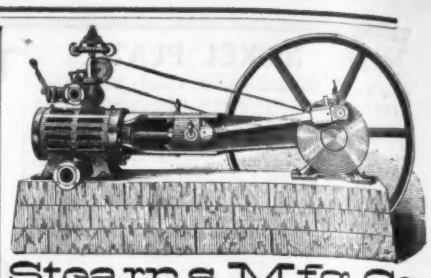

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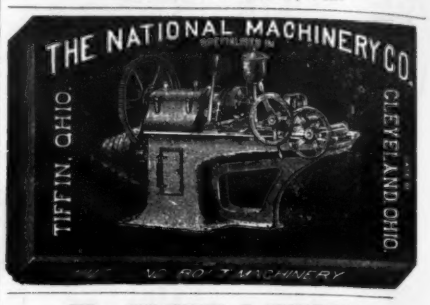

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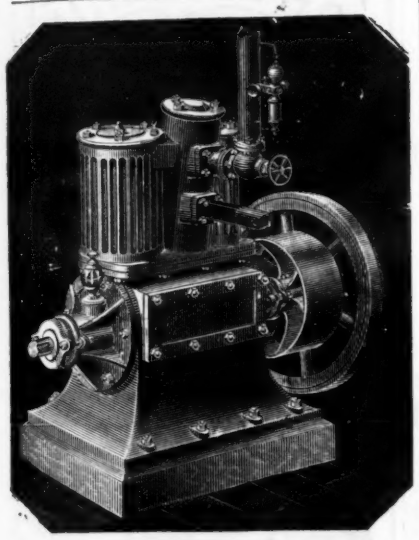

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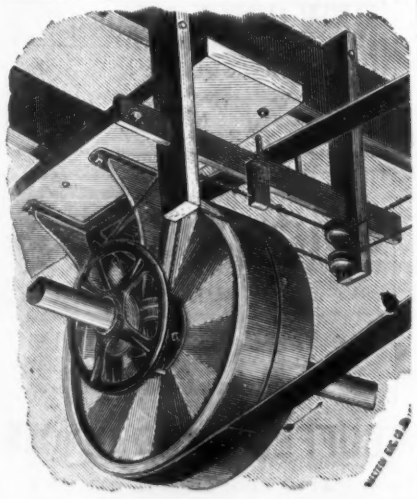

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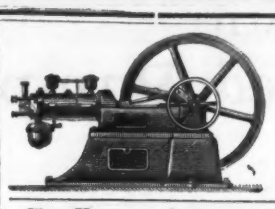

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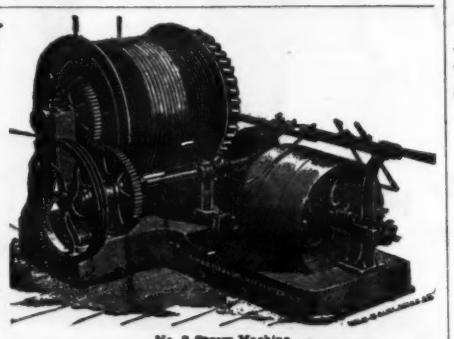

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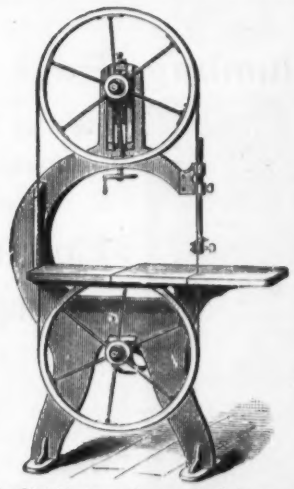

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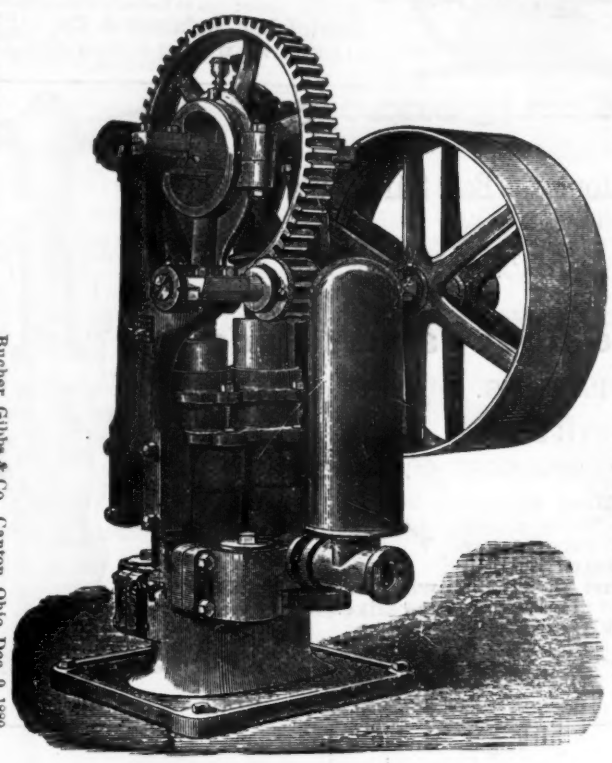
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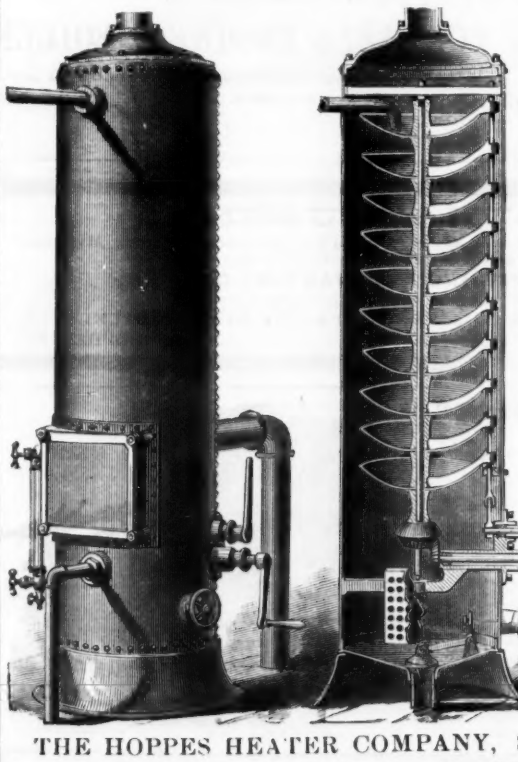
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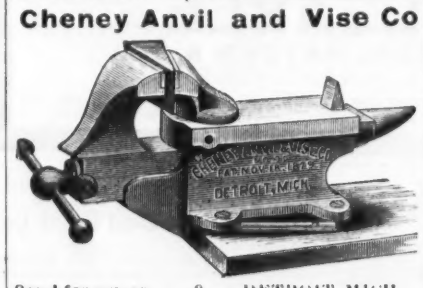
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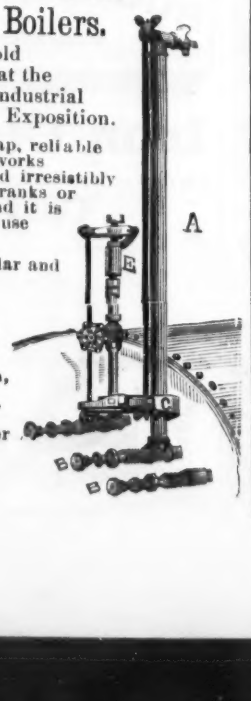

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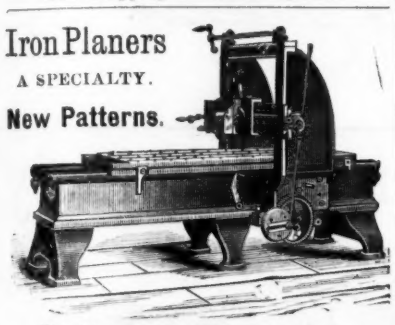
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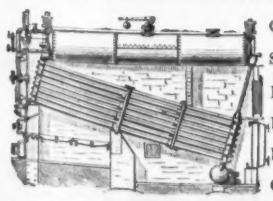
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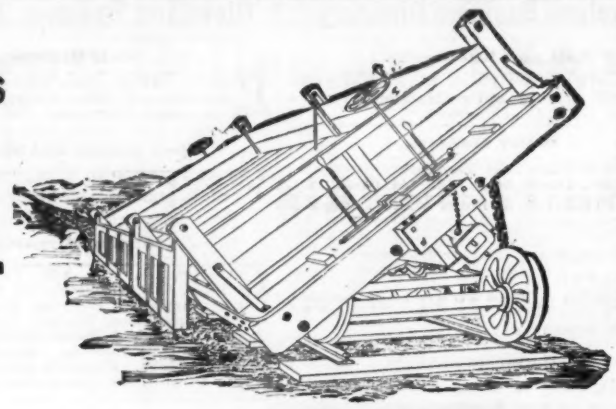

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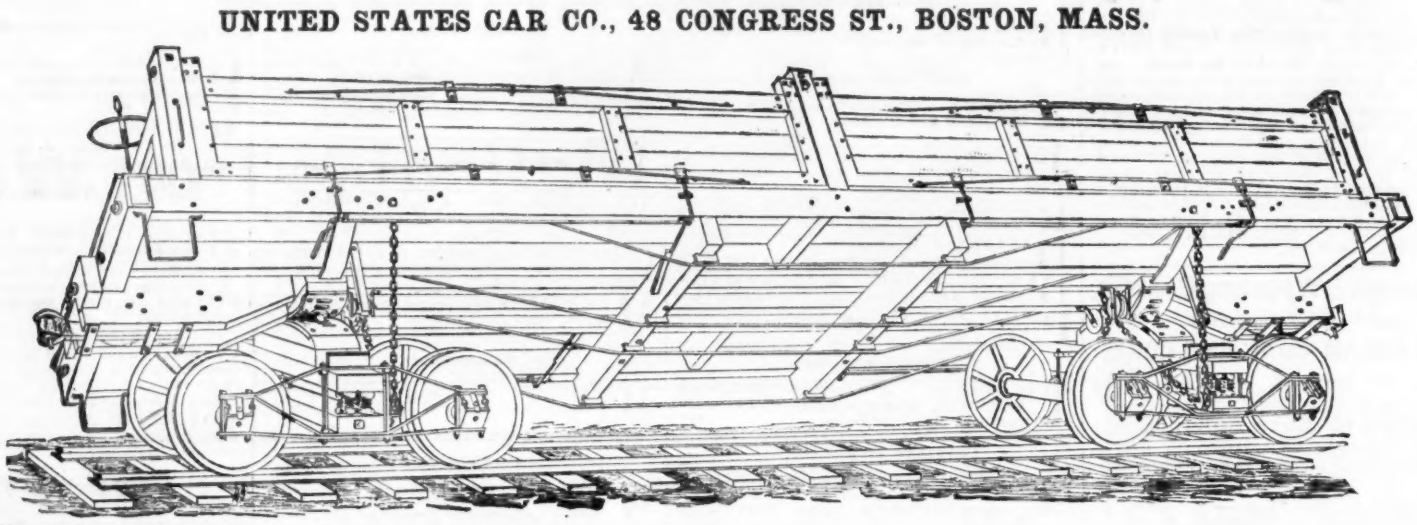

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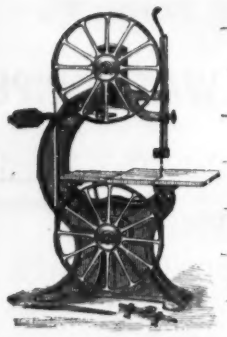

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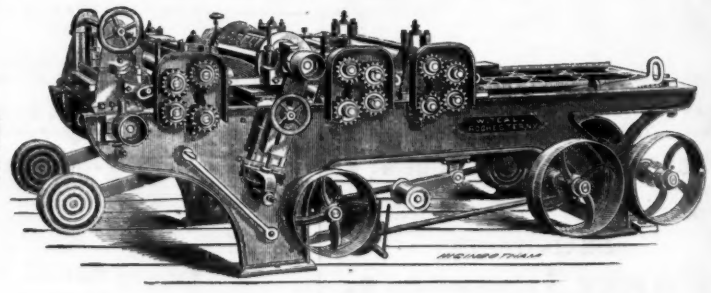

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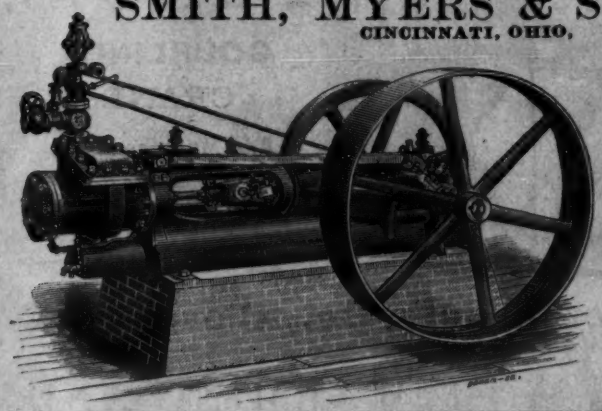

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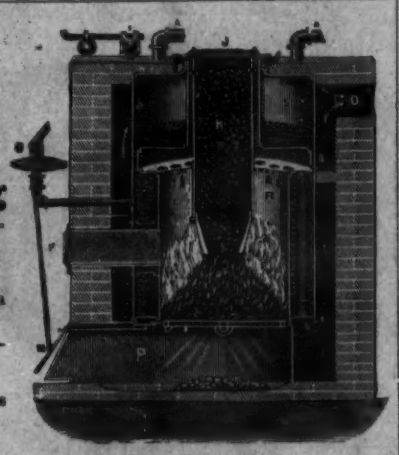

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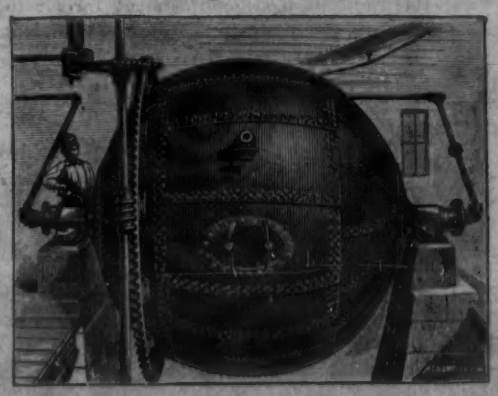

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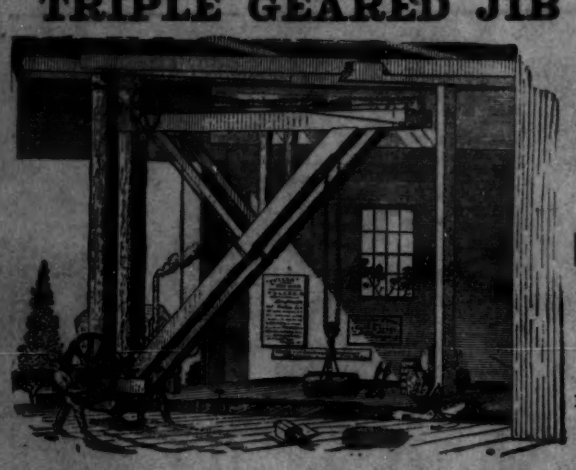

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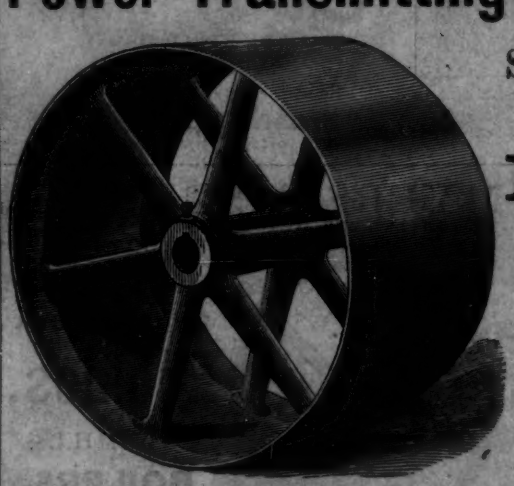

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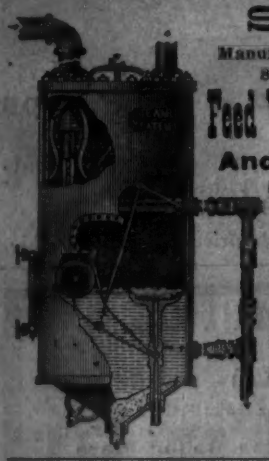

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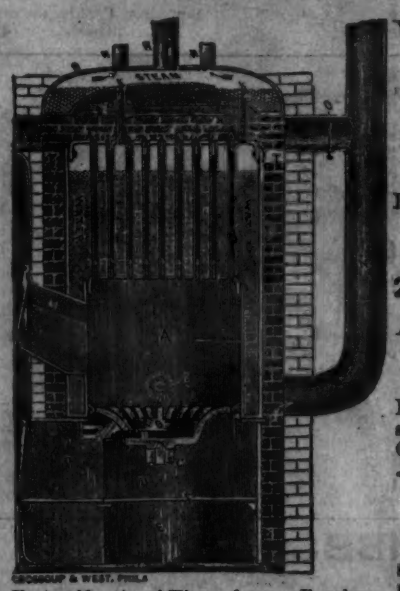

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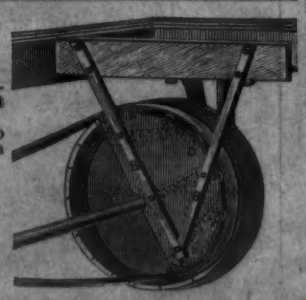

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